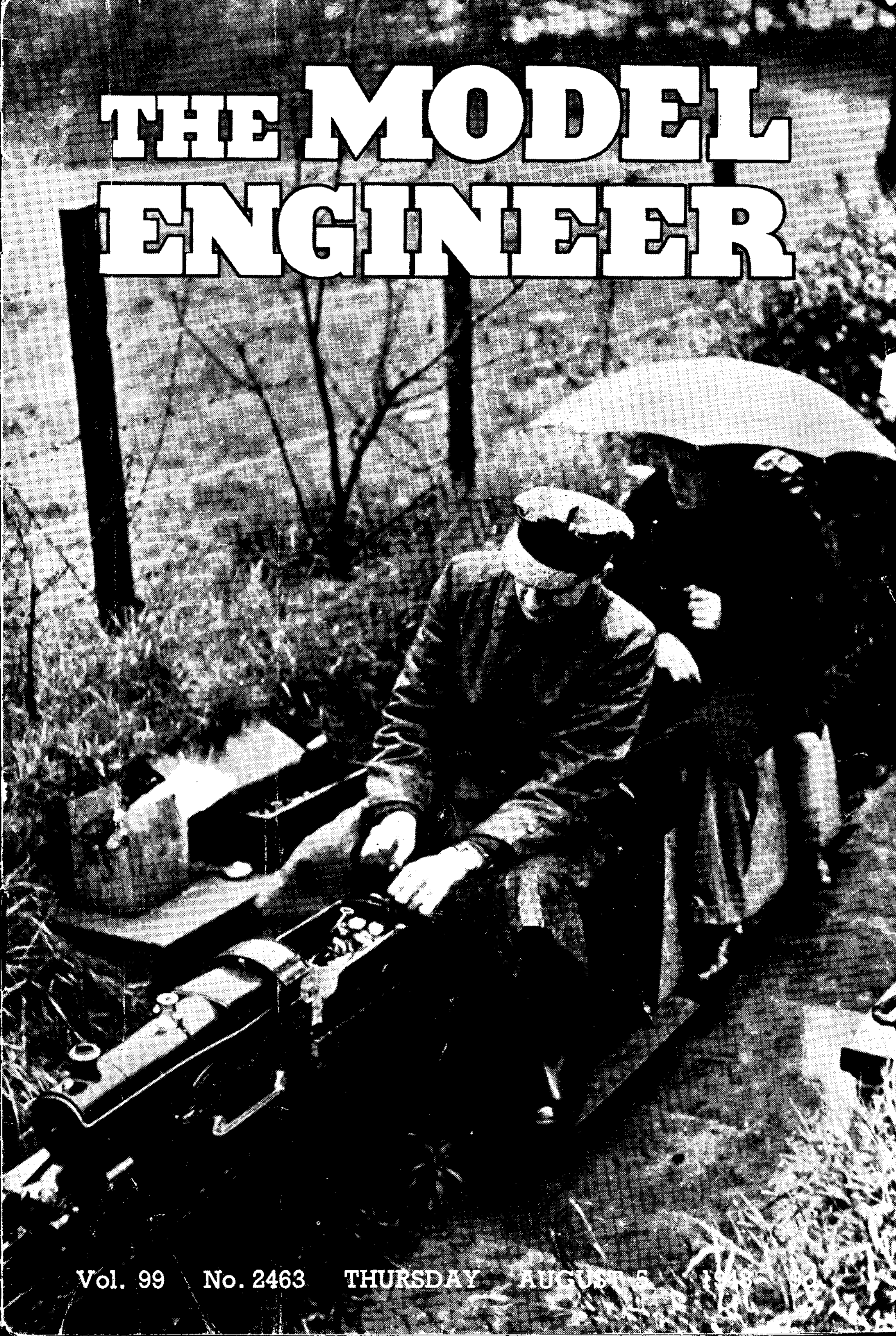
THE MODEL ENGINEER



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The MODEL ENGINEER

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SMOKE RINGS

Our Cover Picture

● THE PICTURE on our cover this week shows the sort of thing which, unfortunately, has been rather too frequent this summer! The occasion was a meeting organised by the North Staffordshire Model Engineering Association when the locomotive section had hoped to enjoy running their locomotives on the outdoor track belonging to Mr. F. A. Buck, of Stoke-on-Trent. The weather, however, was most unkind; but, as our picture shows, enthusiasm refused to be damped down. The engine is Mr. A. W. Tucker's "City Anna," a $3\frac{1}{2}$-in. gauge version of the old G.W.R. "City" class 4-4-0, described and illustrated by "L.B.S.C." in THE MODEL ENGINEER for September 30th and November 11th, 1943.—J.N.M.

Still More Exhibition Awards

● EACH WEEK the list of awards grows, and I am pleased to announce the following which have been offered since I last brought the list up-to-date.

Messrs. W. K. Waugh are giving a complete set of their "Wilwau" castings for "Hielan' Lassie," which are to be awarded for the best locomotive made as a first attempt and entered in the model locomotive section. They are also giving a set of "O" gauge castings, to be awarded at the discretion of the judges for an entry in the section for juniors.

Messrs. A. J. Reeves & Co. are offering a prize of five guineas for the best stationary steam engine.

The Perfecto Engineering Co. are offering a set of castings for the construction of a 0-in. to $\frac{3}{8}$-in. sensitive bench drilling machine, to be awarded at the discretion of the judges for an entry in the class for tool and workshop appliances.

Messrs. Hadrill & Horstmann Ltd. are giving one of their Horstmann adjustable "Pluslite" workshop lamps, complete with retractable magnifying glass panel, also to be awarded at the discretion of the judges in the class for tool and workshop appliances.

From Mr. Geo. Archer comes a prize of one guinea, to be awarded to the competitor entering a mechanical model coming from the greatest distance within the British Isles, as a recompense for the exhibitor's enterprise.

Donations to the prize fund have also been received from Messrs. C. B. Reeve and J. McGuffie.—P.D.

The International Section of the "M.E." Exhibition

● NEVER BEFORE in this country has the opportunity been offered to the British public of inspecting a display of models representing such a large number of countries, as that which will be staged in the international section of this year's exhibition.

This collection, under the same roof as the British exhibits, presents a unique opportunity for the study and comparison of model engineering craftsmanship in eight other countries with the standard achieved by modelmakers in this country. Model locomotive enthusiasts will be afforded the opportunity of comparing models from Austria, Canada, Denmark, France, Sweden and Switzerland. Most of these countries will also be sending model ships, whilst Sweden will send no fewer than eleven exhibits, including a collection of eighteenth-century Swedish ship models, model aircraft, model race cars and engines, a working model drill and lathe, a compound steam engine, a working model Californian oil field derrick and a somewhat unusual model of a canoe to a scale of 1 to 10.

Indeed, this section will contain something of interest for all tastes, and everybody here is eagerly looking forward to the arrival of these exhibits. The descriptions given on the entry forms, although not always very clear, make the most intriguing reading.—P.D.

One Hundred Miles an Hour

● IN THE canteen of Messrs. Rists Cable Works, Stoke-on-Trent, on July 11th, Mr. F. G. Buck's model car, No. 3, "Topsy," running against electrical timing, recorded a speed of one hundred miles per hour.

This is the first time in this country that the century mark has been reached by a model car, and Mr. Buck is to be congratulated on being the first to claim this distinction, more especially as the car with which he achieved this unofficial record, and also its engine, are of his own design and construction.

It should be a matter of great encouragement for all enthusiasts who build their own engines that the above-mentioned speed should have been reached by one of their number. That this should have been achieved in the face of competition by commercial engines—both British and American—on which large sums of money have been spent in research and the employment of first-class designers, and which have at their disposal the best possible materials and production equipment, adds greatly to the credit due to Mr. F. G. Buck.—P.D.

Miniature Perfection

● TO ME, one of the most fascinating models ever made is the $\frac{9}{16}$-in. scale traction engine built by Mr. G. A. Froud, of Weybridge. My first acquaintance with it was made at the Staines society's exhibition in 1946, and the second was at the "M.E." Exhibition last year. On both occasions, the little engine stood upon a table, or shelf, to be admired by all who can admire such things. On June 19th last, I came upon it for the third time, at the Vickers-Armstrong gala at Byfleet, where I was privileged to be one of the judges of the competition models. This time, the little engine was working by compressed air, and fully demonstrated that, though she may be very small and practically perfectly to scale, there is nothing whatever wrong with her working parts. She runs equally well in forward or backward gear, or she will stand with her gears out of mesh and her flywheel idling. All the parts work sweetly, evidence that the workmanship put into her construction is excellent. I am hoping that, before long, we shall be able to publish her story and some photographs of her, for she is a most outstanding example of a model built to a very small scale without impairing its working capabilities, the sort of thing which has always appealed so strongly to me.—J.N.M.

Swanage Calling

● I HAVE received a letter from Mr. H. E. Rendall, an enthusiastic model-maker living in Swanage. He tells me that in a town the size of Swanage he does not expect to find enough model engineers to justify the formation of a club, but he would be very pleased to meet other model engineers living in the district. With this in view he has asked me to publish his invitation for any kindred spirits who may be interested to write to him at "The Knowle," St. Vast's Road, Swanage.—P.D.

Hobbies in Schools

● I HEAR that recently at the annual Parents' Week-end held at Monkton Combe School near Bath, exhibits by various clubs formed among the boys included such widely differing subjects as model engineering, campanology, art, pottery, philately, magic, carpentry and wireless.

It is encouraging to learn that hobbies are so well established in our modern schools. I am sure that boys who have the opportunity to enjoy these pursuits at an early age will become better citizens and husbands in years to come. Being concerned as I am with the production of THE MODEL ENGINEER, I feel that I would have derived great benefit from a study of magic !—P.D.

A South Eastern Model Engineering Exhibition

● THE SECOND exhibition organised by the South Eastern Association of Model Engineers opens at Bromley County School, Hayes Lane, Bromley, Kent, today, August 5th. The official opening will be performed by the Mayor of Bromley at 3 p.m. and the show will remain open daily from 10 a.m. to 9 p.m. until August 14th.

Of special interest will be the displays of working models. Three passenger-carrying tracks will be in continuous operation. There will also be a chance to drive a locomotive oneself. Control-line flying will be demonstrated, and there will be a race car track.

One of the largest displays of models and tools, made by members of the twenty clubs who have combined to make the show possible, ever held, will be on show in the hall. Examples of every type of model engineering will be there.

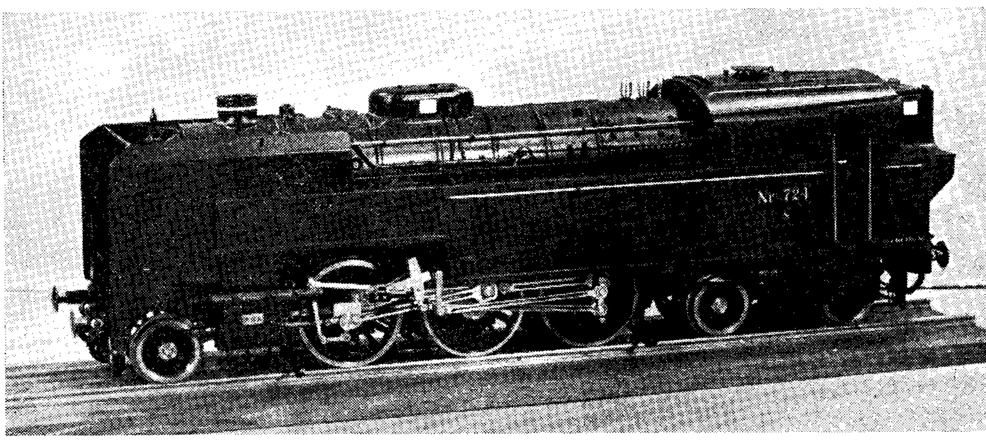
The tremendous success of last year's show and the many new models promised points to a really wonderful display.—W.H.E.

WHAT TO SEE
AT THE 1948 "MODEL ENGINEER" EXHIBITION

The Competition Section

IF proof were needed that model engineering is now passing through a period of great expansion, it will be demonstrated beyond any doubt at this year's exhibition. Indeed, there has been such a large entry of really first-class models that one of our staff was heard to remark that all the new models have been entered this year and there may be fewer next year as a result. This we are sure, however, is quite wrong, the real reason being that every year model engineering is being adopted as a hobby by more and more people. Possibly many of those who had their first experience of engineering during the war, are now settling down and acquiring their own homes and workshops.

The models which are briefly described in the following pages have been selected from among the earlier entries, and at the time of writing entries are still pouring in, and many models of outstanding quality and interest will be displayed in addition to these described.



A 1/45th scale Danish State 2-6-4 tank locomotive to be seen on the International Stand

International Section

It is certain that a focal point of great interest this year will be the International Section, where models from Canada, Holland, France, America, Austria, Denmark, Sweden, Norway and Finland will be on exhibition. Unfortunately, at the present time we are unable to give any exact details of these models, except to say that they will range over a wide variety of types, and there is no doubt that among them will be seen some of the finest models from the countries which they represent. This unique opportunity of making a comparison as between the standards of craftsmanship achieved in this and other countries, should alone be sufficient to justify a visit by all model engineers imbued with the spirit of friendly rivalry.

Traction Engines

For those who are interested in traction engines, stationary engines, marine engines and steam engines of all types other than railway locomotives, this year's exhibition will have its full quota of interesting exhibits. Indeed, it almost seems that as the use of steam in agriculture, industry and commerce is replaced by other forms of power, the activities of model engineers in reproducing some of the fast disappearing types is stimulated by the difficulty of finding suitable prototypes.

Models in Motion

Reintroduced this year at the request of many readers is the multi-gauge, live steam passenger-hauling track operated by the S.M.E.E., while the circular track and water tank for the demonstration of model aircraft, model race cars and model power boats, will again be seen this year, and is bound to be a popular feature, especially for those who have not yet experienced the thrill of watching model cars at speed or stunt-flying by model aircraft controlled by the operator. We understand that this circular arena will also be used for the purpose of demonstrating model steam traction engines, running under their own power within the enclosure, where they will have room to manoeuvre without danger of running over the toes of visitors.

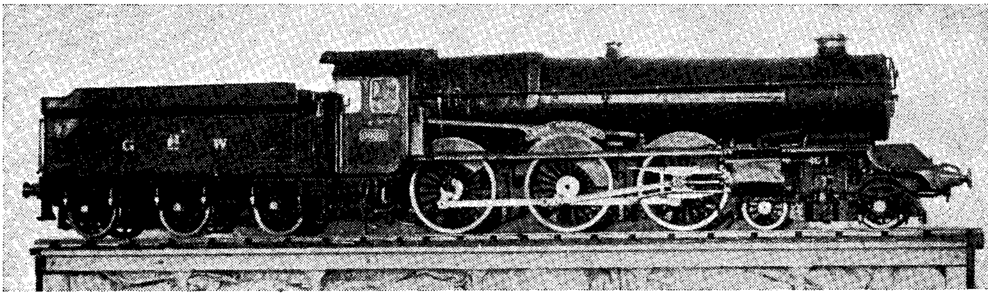
Locomotives and Railways

As the time draws nearer to *the* Exhibition, a clearer idea can be formed as to what will be seen there. So far as locomotives and railways are concerned, the competition section appears to offer a selection of fine models which arouses expectations which are quite exciting to the enthusiast.

A perusal of the entry-forms shows a marked decline in the number of "free-lance" locomotives, balanced by an increase in the "prototype" class; and among the latter, there will be some which promise to be really outstanding. For example, from Crewe we are to have a 1½-in. scale L.M.S. 4-6-2 "Duchess" class engine and tender, on which all the details and equipment of the prototype are faithfully copied to scale. The total length is 9 ft. 8½ in., and the weight about 7 cwt.

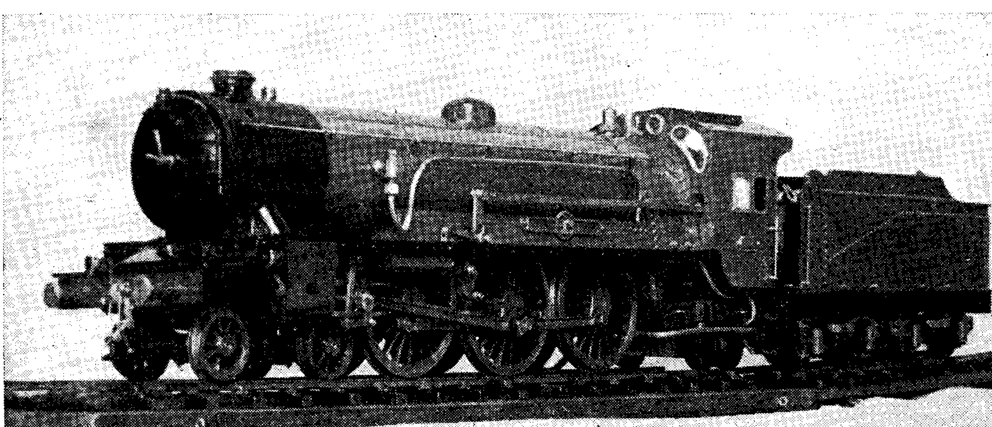
But such an engine as this is almost bound to find a rival in a ¾-in. scale G.W. "King" class engine in which, also, all the details and equipment of the prototype are faithfully copied to scale; and the judges are evidently not going to have an easy time trying to decide which of these two entries is the more meritorious! The final decision may very well turn on the fact that the builder of one is a foreman coppersmith, while the other has been constructed by a restaurant-car attendant.

There are, however, at least two other potential rivals to the above entries; one is a 1-in. scale Caledonian Railway 4-4-0 locomotive by an indefatigable enthusiast aged 84, and the other is a 13/16-in. scale G.W.R. 2-4-0 double-framed passenger engine of the lovely old "River" class, and promises to be among the most spectacular exhibits from the point of view of appearance.



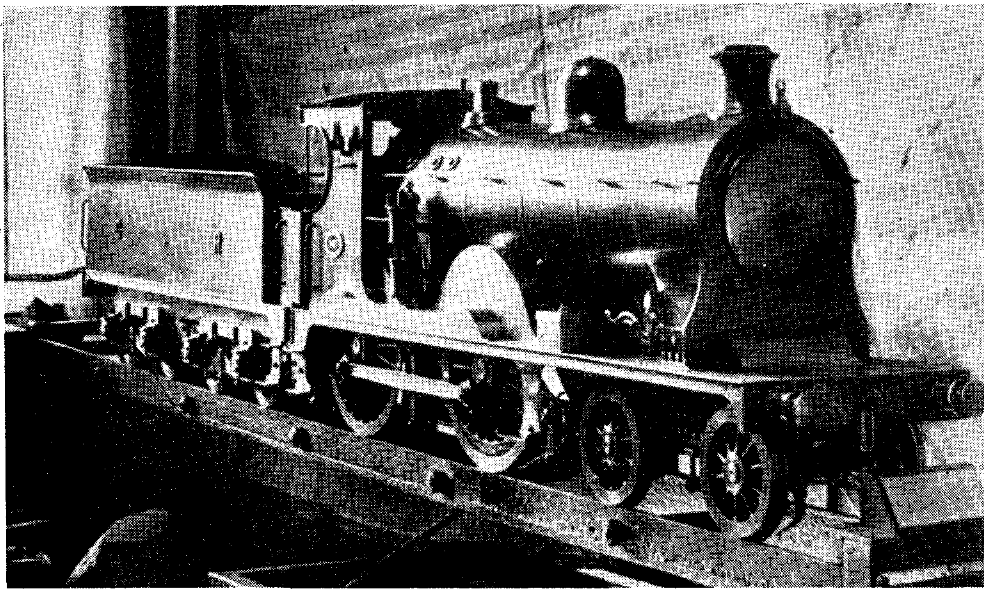
A ¾-in. scale G.W.R. "King" class engine, the details of which include working vacuum brake and miniature sight-feed lubricator

An interesting and unusual entry is a 1/7-scale reproduction of a Hunslet Engine Co.'s 0-4-0 tank quarry engine as running on the Padarn Railway in North Wales. The prototype gauge is 1 ft. 10¾ in., while that of the model is 3½ in., and since the model has been built primarily as a working model, it should make a powerful unit in a small, handy and easily-transportable form.



A free-lance 4-6-2 engine for 2½-in. gauge

A ¾-in. scale L.M.S. "Princess Royal" class engine, the builder of which set out to construct a working model as near as possible to the prototype design, should be worth careful study, especially by enthusiasts who possess the same urge. Two other ¾-in. scale engines seem to merit at least a mention in these notes; they are: (1) a G.N.R. Atlantic in which the

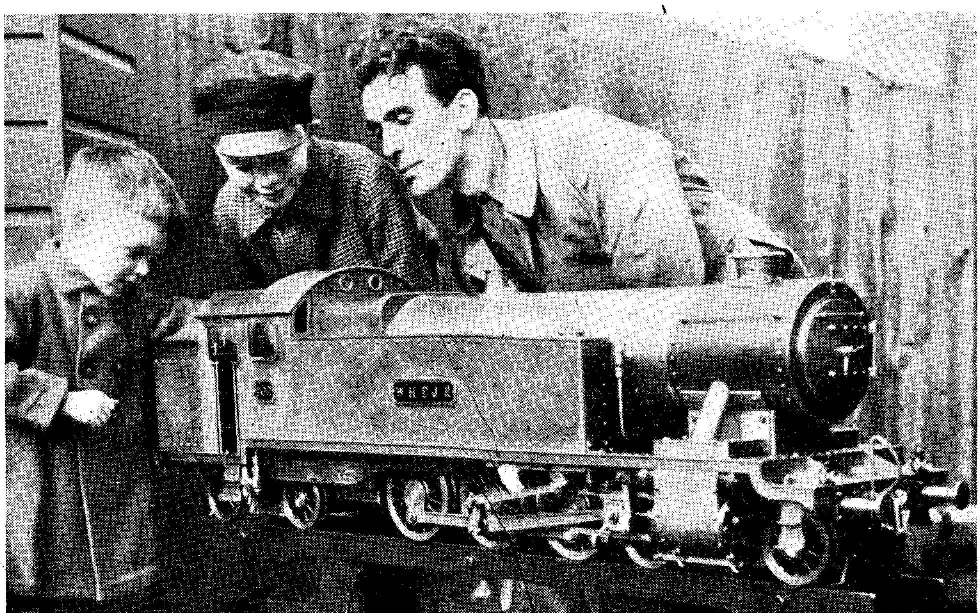


A 1-in. scale replica of a Caledonian Railway " 140 " class 4-4-0 locomotive

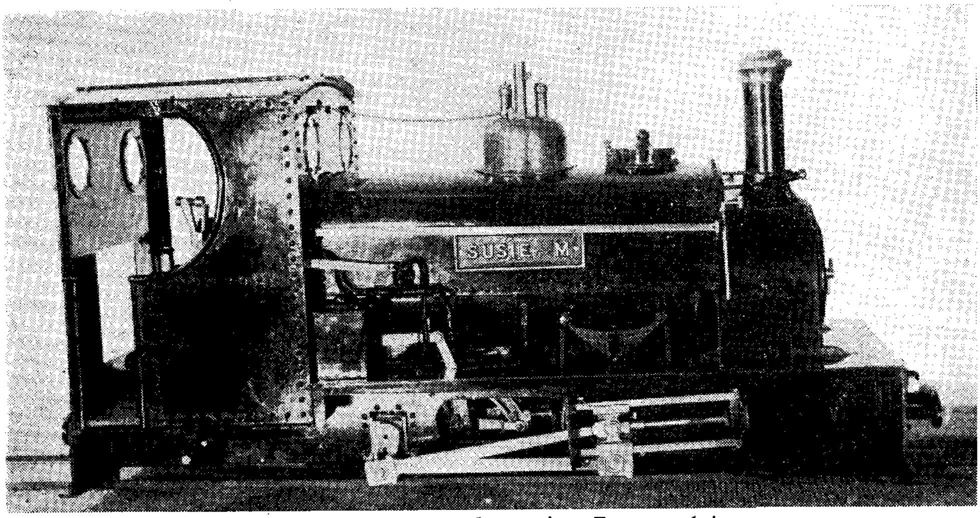
use of castings was deliberately kept down to a minimum, and (2) an L.M.S. Class "4" 0-6-0 engine built to a sectional diagram purchased from the Locomotive Publishing Co. Ltd., and all fittings made as described by " L.B.S.C."

The Great Northern Railway of Ireland was the source of inspiration for a South London reader who is entering a 2½-in. gauge 4-4-0 engine. It is not very often that model locomotive builders favour Irish railways, due to the 5-ft. 3-in. gauge ; but, in this particular case, modifications have been made in order to overcome the difficulty.

What promises to be a most intriguing entry



The latest example of the well-known " Halton " 4-6-4 tank engine for 5-in. gauge



A 1/7th full-size Hunslet quarry locomotive. Runs on $3\frac{1}{2}$-in. gauge

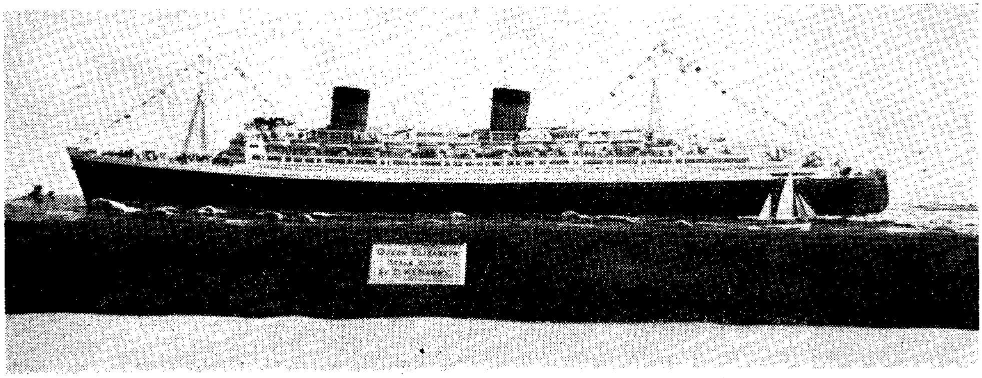
is a free-lance three-cylinder 4-8-4 steam locomotive for "OO" gauge! The boiler has an internal firebox, fitted with an oil-burner, and is provided with a combustion-chamber and tubes. The outside cylinders are $\frac{1}{4}$ in. bore by $\frac{3}{8}$ in. stroke; the inside cylinder is $\frac{1}{4}$ in. bore, but in order to clear the rails, the stroke is only $\frac{5}{16}$ in. The port sizes are 0.05 in. by 0.2 in. for admission, and 0.1 in. by 0.2 in. for exhaust. Other fitments include: an axle-driven pump, hand-pump on tender, top-feeds, displacement lubricator and sprung axle-boxes for bogie and driving-wheels.

A novel feature of the Exhibition this year will be the "International" stand, on which will be shown examples of work by MODEL ENGINEER readers in many countries overseas. At the time of writing, the indications are that locomotives and railways will be very well represented, especially among the small-scale miniatures that are coming from Canada, Holland, France, America, Austria, Denmark, Sweden, Norway and Finland. These exhibits are, of course, entirely new to THE MODEL ENGINEER Exhibition, and should provide much to interest the visitors, and not a little food for thought for some.

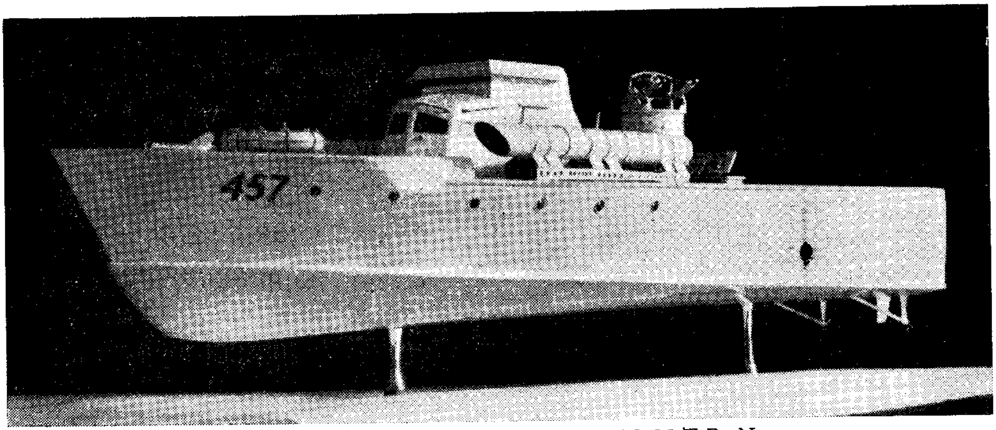
This brief review, of necessity, can mention only a few of the good things which will attract railway-minded readers; but it contains, we hope, enough to show that the "Locomotives and Railways" section of the Exhibition will be at least up to the best previous show; the above selection is taken from the Competition section only, for shortage of space precludes any detailed reference to locomotives in the Loan section or to the numerous entries in the "O"-gauge and smaller classes.

Ship Models

The ship model section of THE MODEL ENGINEER Exhibition this year is bigger than ever and promises to be one of the principal features. The entries come not only from engineers and shipyard workers, but from all sections from society, including company directors, doctors, Navy and Army officers, and trades-



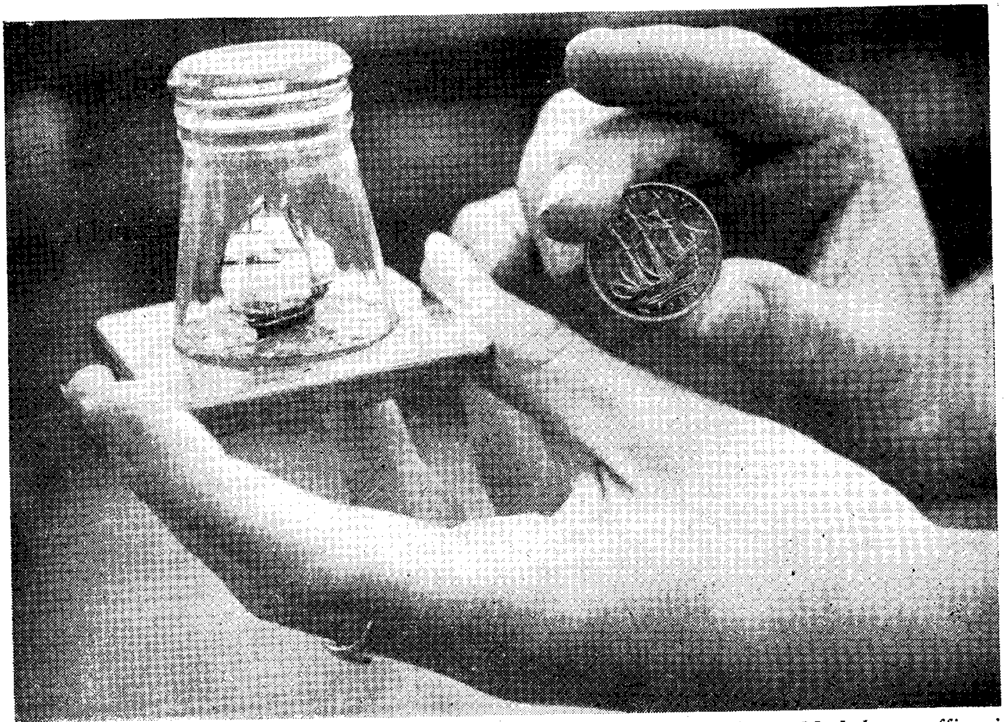
A 1-in. to 50-ft. scale model of the "Queen Elizabeth," by D. McNarry



Mr. D. Marshall's partially assembled model M.T.B. No. 457

men and workers of all kinds. In two instances we have entries from husband and wife, the workshop in one case being given as "one side of the dining-room table" for the husband, and "the other side" for the wife—a very happy arrangement. Ages of the entrants range from 15-86, and the workshop facilities from the kitchen table and the simplest of hand tools, to the most elaborately fitted workshop.

The models include all types—cabin cruisers, motor torpedo boats and A.S.R. launches being probably the most popular choice as prototypes. There is good reason for this. To make a reasonably-sized model, the scale can be as large as ½ in. or even ¾ in. to the ft., and at this scale every detail can be included. Moreover, the hull can be made to practically the same proportions as the original and still give sufficient displacement to carry the power plant and to give adequate freeboard with appropriate superstructure. The power plant can be electric, petrol, or flash steam and examples



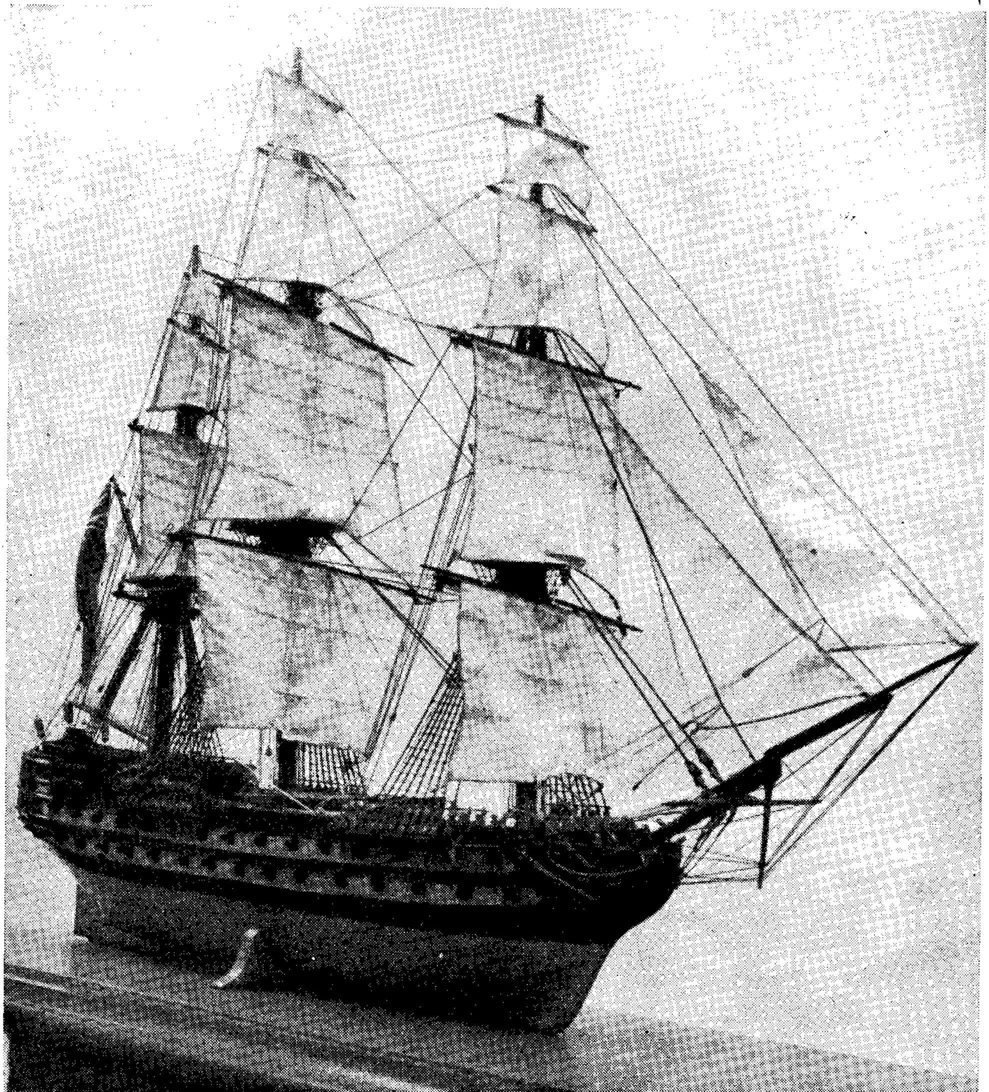
A miniature model of the ship shown on a halfpenny, covered by a tot glass. Made by an officer in the Merchant Navy

of these various types may be seen at the exhibition.

A number of familiar names are to be found on the entry forms. Dr. Rowland, of Northampton, who won the sailing ship championship cup in 1937, is sending his model of the ship *Brynhilda* which has been illustrated in both THE MODEL ENGINEER and in *Model Ships and Power Boats*. Mr. McNarry, who won the four-masted barque *Archibald Russell*; he will be remembered for his model of s.s. *Livorna* which won a medal in last year's exhibition. Mr. Kilner Berry, well known for his series of articles on water-line model liners in *Model Ships and Power Boats*, sends his model of R.M.S. *Egypt*; this will be a valuable source of information to readers of his articles. An interesting exhibit comes from the Rev. A. Everall, of Sheffield;

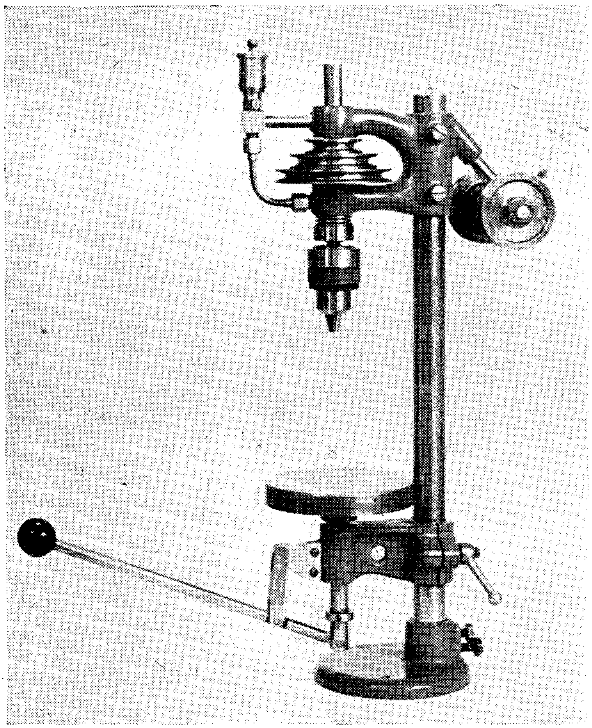
A super-detailed model of H.M.S. "Vanguard," made by G. H. Davis. Steam-driven, 6 ft. long

championship cup for steamship models last year for his beautifully detailed model of *Stirling Castle*, is sending a lovely model of the liner *Queen Elizabeth*. Mr. Honey, of the South London Ship Model Society, sends a model of the yacht in which Amundsen made the northwest passage for the first time. Mr. Borrowman, secretary of the same society, sends a model of a Chinese junk. Mr. Taylor, of the Solent Ship Lovers' Society, is sending a fine model of the this is a model of an Egyptian sea-going ship of the V Dynasty, and entailed an immense amount of research, and is a valuable contribution to our knowledge of these ships. Another exhibit from Sheffield is the model of a Whitby fishing coble by Mr. Maltby. This is built exactly as the prototype and the particulars were taken from an actual coble which was beached at Whitby. Another entry is a sailing model of Drake's *Golden Hind*. Sailing models and ships of



A $\frac{1}{8}$-in. scale model of a 74-gun ship of Nelson's period. Made by Captain J. T. Shenton, R.N. (retd.)

this period are very rare and it should be interesting to see how this entrant has overcome the problems involved. A notable entry is that of a 74-gun ship of Nelson's time. A photograph of this model appeared on the cover of the June issue of *Model Ships and Power Boats*. This model was made by Captain J. H. Shenton, R.N. (retd.); he is 86 years of age, and is still making very fine models of sailing ships all to $\frac{1}{8}$-in. scale. He served in the navy in the days of masts and yards, and has an intimate knowledge of ships' rigging and details. Mr. G. H. Davis, whose drawings of various types of ships are well-known to readers of the *Illustrated London News*, and other publications which are much sought after by ship modellers, sends a 6-ft. model of H.M.S. *Vanguard*. This is a working model with a complete steam plant, and at the present moment is being prepared for radio control. Another interesting model is a 6-ft. steam-driven model of the destroyer *Javelin*, made to the designs published in The Model Engineer during 1944. We have seen this on the water, and in addition to being an excellent piece of modelling in metal work—the hull being built on frames with the strakes soldered on, it has a good turn of speed and is very seaworthy. Ships in bottles are always



One of the drilling machines that will be on show at the Exhibition

popular, and several good examples will be shown. One, as a variation from the usual type, is enclosed in an inverted tot glass. The model is a tiny replica of the ship shown on the halfpenny and is, itself, but little larger than the picture on the coin.

The examples mentioned have been chosen at random from the entry forms; other examples, equally interesting, will be found at the exhibition.

General Models

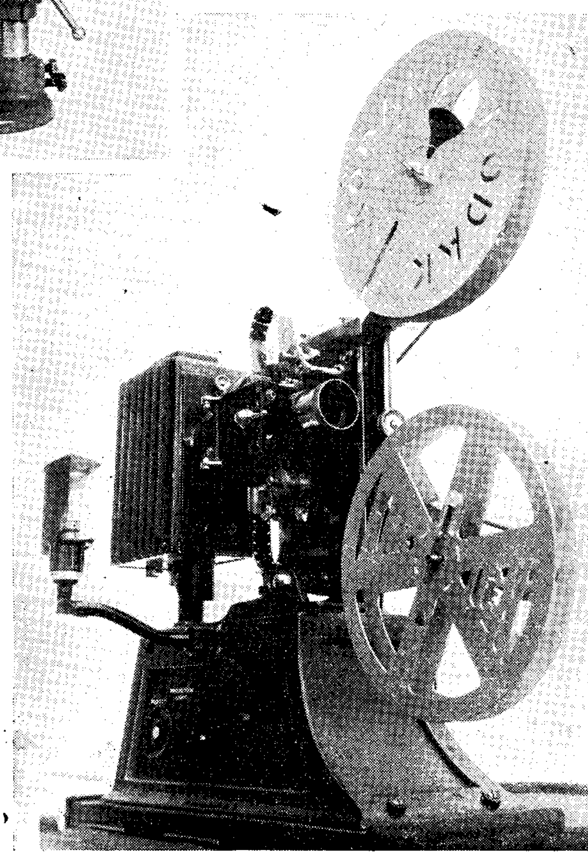
The information available regarding the models entered in the competitions, at a date prior to the exhibition, is not sufficiently complete to enable us to pick out, with unerring accuracy, the really high spots in the various sections, but it can at least be said, without hesitation, that the variety, novelty and general interest of the exhibits is well up to the standard of previous exhibitions.

Among the stationary steam engines, mention may be made of a twin-cylinder balanced, high-speed steam engine, which is produced from the design by the late Mr. Henry Greenly, published in THE MODEL ENGINEER during 1908. Another interesting model in this section is a complete generating set, comprising an engine, dynamo and switchboard, of the type common in the 1890's. The older types of stationary engines are represented by a free-lance beam engine, and representative of a type of model which is now much less common than a few years ago is a free-lance vertical boiler and engine.

A popular type of marine steam engine is represented by a triple expansion marine engine, constructed from particulars and sketches obtained while the exhibitor was working as a fitter in the shop in which the prototypes were constructed. Another engine in this class is a model compound, surface condensing engine, based on the description of such an engine in Professor Jameson's "Steam and the Steam Engine."

I.C. Engines

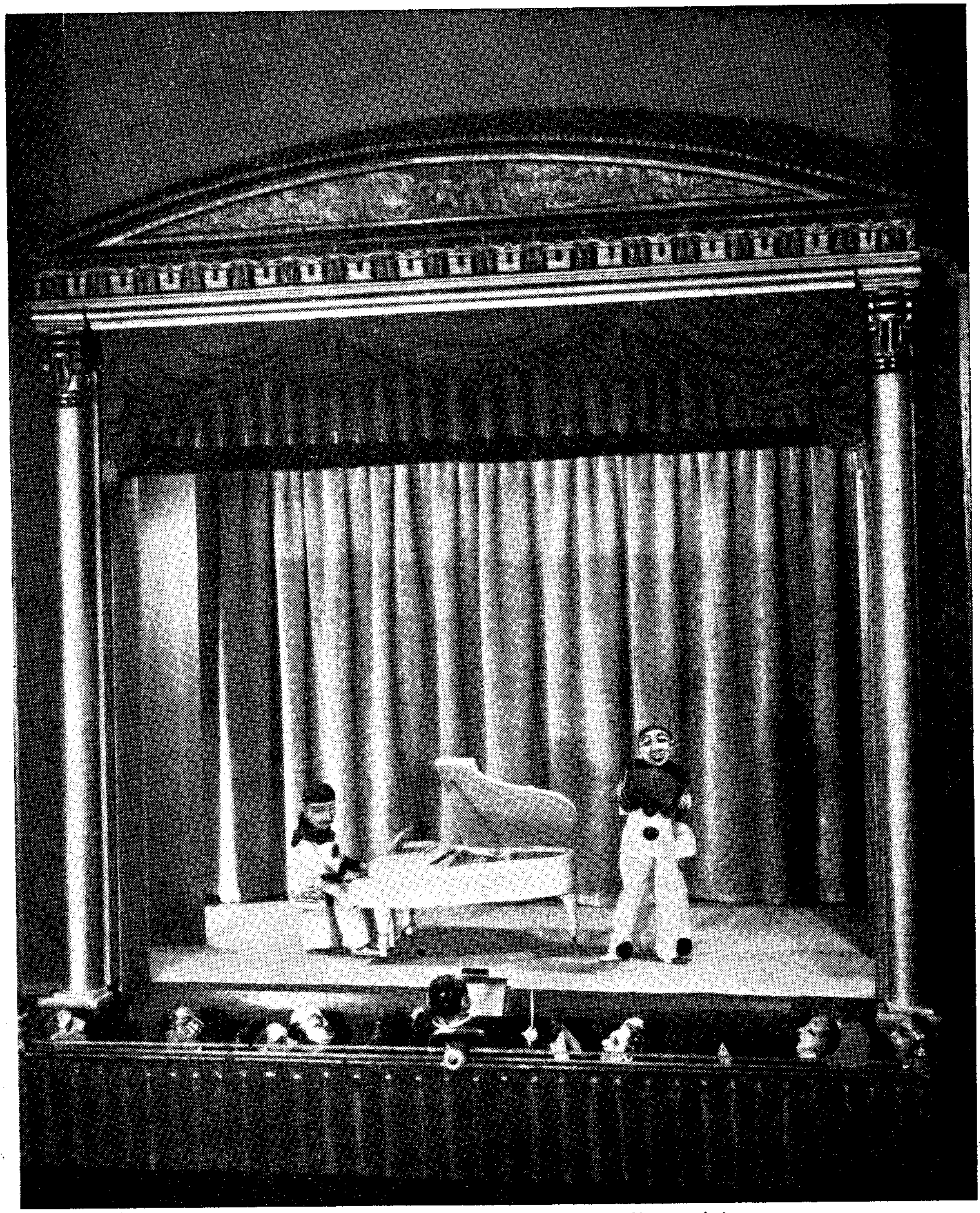
One of the most interesting models in the internal combustion section is a



An example of the "M.E." home cine-projector but with many detail improvements

four-cylinder, water-cooled engine, complete with magneto ignition. This is not a new model, and it has been mentioned in THE MODEL ENGINEER on one or two occasions, but it has never before been entered in an MODEL ENGINEER Exhibition. Among other models in this section may be mentioned a 15 c.c. four-stroke to a well-known MODEL ENGINEER design, another proprietary design of engine of 25 c.c., and a free-lance 15 c.c. racing engine for a Class " B " hydroplane.

The cult of the model racing car has attracted many constructors, and a fair selection of exhibits in this department have been received up to date. Some of these are modelled fairly faithfully to prototype, at least so far as external appearance and chassis details are concerned, and among these may be mentioned a model of a 2-3 litre Grand Prix Bugatti, powered with a



" The Playhouse Puppets." Music-hall in miniature

Hornet engine, a $4\frac{1}{2}$ litre supercharged Bentley, powered with a 5 c.c. engine produced from the constructor's own die castings, and a 1/6th scale 8 h.p. M.G. car, with electric motor drive. Two cars fitted with the Ensign 10-c.c. engine are entered, one being built to the *Model Car News* "Special" design, and the other having a free-lance chassis, while one exhibitor has entered two cars with 5-c.c. and 4.5-c.c. engines respectively.

Two exhibitors have entered models of motor cycles, 500-c.c. Triumph and 495-c.c. A.J.S. respectively, the latter being fitted with a working petrol engine.

Machine Tools

This section is always one of the largest and the most interesting in the Exhibition, and this year's exhibits are fully up to standard. Several exhibitors have entered lathes of various types, including a 2-in. lathe with fully enclosed headstock for vee-belt drive, two watchmakers' lathes, and a jeweller's lathe which is a reduced copy of a larger lathe in commercial production. Drilling machines are again very popular among exhibitors, and include two or three examples of THE MODEL ENGINEER sensitive drilling machine, in some cases improved and modified, and a number of free-lance machines. Several examples of milling and dividing attachments are also entered, and other accessories include tailstock die holders, grinding spindles and equipment for fitting dial-test indicators and comparators.

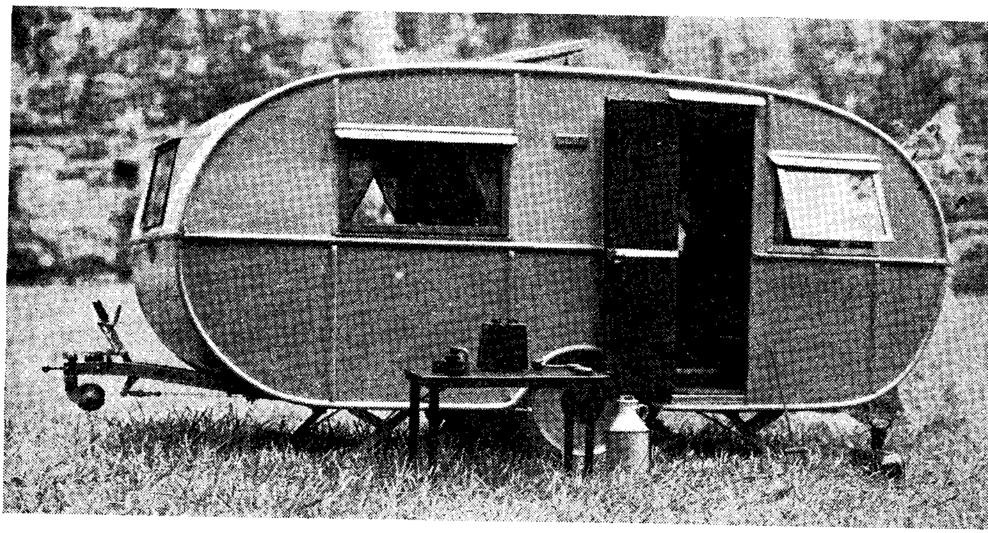
Other interesting models in this section are a jig-saw machine specially adapted to take small tension files, and a power-driven shaper of 3 in. stroke by 3 in. traverse.

Non-working Models

Quite a number of interesting scenic and representative models are entered, such as examples of country cottages, models of Anne of Cleves' house, Mrs. Whistler's cottage, and Ixworth Church to a scale of $\frac{1}{4}$ in. to the ft. Other interesting models in this section include a hand-beaten, miniature 15th century suit of armour, $11\frac{1}{2}$ in. high, a trailer caravan, complete with all furniture and equipment, a Welsh hand-loom, and a fully-equipped marionette theatre.

Horological and Scientific Apparatus

At least one example of the ever popular MODEL ENGINEER Home Cine-projector is entered, in this case very considerably modified and improved. A very novel exhibit is a model of a four-lever padlock in transparent Perspex, and an equally unusual model is a complete cold-storage system with working refrigerator. A number of interesting clocks are also entered, including an 8-day bracket clock, an 8-day regulator and three electric clocks.



A near-side view of the Raven caravan "Mobillet" model

For the Bookshelf

Electronic Engineering, edited by E. Molloy. (London: George Newnes Ltd.) Price 5s.

Books on electronics are likely to be published in ever-increasing numbers in the course of time. This book, edited by the editor of our esteemed contemporary, *Electrical Engineering*, presents a fairly comprehensive survey of the subject so far as it has been developed today. The nine chapters have been collated from various sources, and give thoroughly up-to-date information concisely and in very handy form.

SMALL LATHE ACCESSORIES

by S. A. Stead, B.Sc. (Australia)

MANY readers, possessing small lathes of about $1\frac{5}{8}$ in. to 2 in. capacity, will have felt the need for suitable carriers for centre work. Possibly these have been hard to obtain ; at least, they are not plentiful in South Australia. However, the difficulty is not hard to overcome with a few odds and ends from the scrap box. A strip of brass or mild-steel is cut to suitable length, sawn down the centre as shown in Fig. 1A, then opened out and the ends bent inwards as shown in Fig. 1B, with the gap filed out to $\frac{1}{4}$ in. In this gap is brazed or silver-soldered a short end of $\frac{1}{4}$ in. rod drilled and tapped 2-B.A. The shape may be improved by the use of the file. A clamping screw is made of mild-steel turned down and screwed 2-B.A., with the end tapered off to about $\frac{1}{16}$ in. The head may be slotted, squared or cross drilled for a tommy-bar as, desired. Case-hardening will undoubtedly prolong the working life of the screw, but it is not necessary for the immediate success of the carrier.

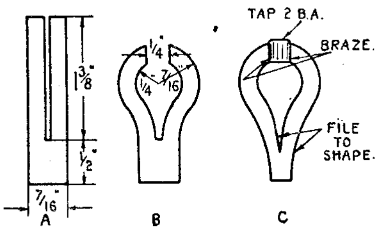


Fig. 1. *Lathe carrier*

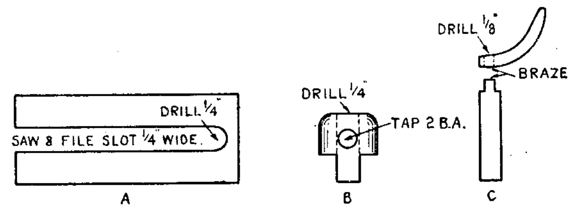


Fig. 2. *Tool rest*

The writer has little information about the activities of other model engineers, except that gained from reading this journal, but has come to the conclusion that many do not fully appreciate the possibilities of hand turning, using the watchmaker's graver. Perhaps, on the other hand, it is so widely practised that writers take it for granted. However, I have recently found use for the method and soon decided to discard such temporary tool rests as pieces of bar clamped in the top slide tool holder in favour of a rest, designed to fit the lathe, but made entirely from scrap found about the workshop. The baseplate consists of a piece of mild-steel, cut as shown in the sketch (Fig. 2A). The pillar, shown in Fig. 2B, was turned from mild-steel bar, $\frac{5}{8}$ in. diameter, with the sides cut away to form the tongue shown. The pillar was brazed in the open end of the slot cut in the baseplate and the drill run down through the hole to clean any blobs of brass which may have formed in the hole. (By the way, have you ever used boracic acid as a brazing flux ? The metal flows well and the flux washes off in water without forming that hard glassy scale which results from the use of borax.) A session with the file, to brighten up the work, and to round off the corners, is well repaid. Making the tool rest proper is simple if there is an odd length of steel tubing of suitable strength and from $\frac{3}{4}$ in. to 1 in. diameter available. The length will be determined by individual needs, but in any case it is split longitudinally in two places to leave a piece slightly more than a quarter of the circumference. A small hole, drilled near one edge, is dropped over a spigot turned on the end of a piece of $\frac{1}{4}$ in. steel rod. (Fig. 2C.) When the two are brazed together, the file may be used again to shape it as desired. The writer clamps the rest in the pillar by means of a short 2-B.A. screw cross-drilled to take a tommy-bar made from No. 32 silver-steel about 1 in. long and fitted with small knobs like the handle of a miniature vice. The whole is clamped down to the lathe bed by means of a $\frac{1}{4}$ in. bolt.

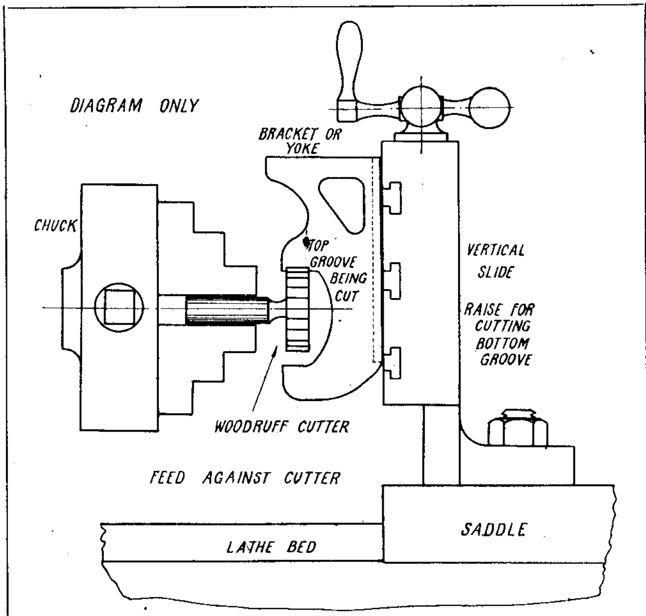
An oxidised finish improves the appearance of articles such as these and may be simply applied by fusing potassium nitrate (saltpetre) on the various parts. The writer has done this successfully in two ways ; the articles are dipped into a concentrated solution of the salt and heated in the blowlamp flame until the salt fuses and the desired colour is attained, or the salt is melted and the parts immersed in it until dark enough. They are plunged into cold water and washed thoroughly, then rubbed vigorously with an oily cloth. Two precautions should be observed in the process—no combustible material should come near the molten saltpetre, and when plunging the parts into water, care should be taken, as there may be a few particles of hot salt thrown up by the spluttering which usually occurs. It should have been mentioned above that before immersion in the salt, the article should be free of all trace of grease, and the oiling is essential to prevent rapid rusting.

A few dimensions are suggested but they may be readily varied to suit the needs which may arise. The writer has felt that several tool rests of varying widths would be useful and would save some time on awkward jobs.

A $3\frac{1}{2}$-in. Gauge L.M.S. Class 5 Loco.

by "L.B.S.C."

THE guide-bars I am specifying for the little L.M.S. "Class 5" engine are a one-sixteenth edition of the full-sized article, and are made from 7/32-in. by $\frac{5}{16}$-in. section steel, or the nearest larger size available. Silver-steel is about the best for wear-resisting qualities; rustless may, of course, be used by anybody who fancies it, and ordinary mild-steel will give excellent service. No detailed instructions are needed; it is a simple job to mill or file the pieces of steel to the dimensions and outline shown in the illustration. The longer-tapered end should be filed, or faced off in the four-jaw chuck, to be absolutely dead square with the sides, so that it can be butted up tightly against the cylinder cover, and will be parallel with the piston rod.



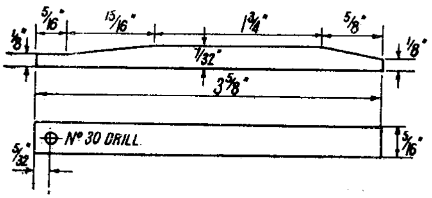
How to mill guide-bar grooves, using vertical slide

The brackets or yokes for supporting the bars, may either be castings or built up from $\frac{1}{8}$-in. plate. Castings are best, and also most realistic, as the beading around the edge will be cast on, and the effect is the same as in full size. The supports or extensions to which the bars are bolted, will be cast on, and save a lot of trouble. Little is required in the way of machining. Failing a regular machine, the easiest way to machine up the flange which bolts to the main frame is to clamp the casting under the slide-rest tool-holder with the flange at right-angles to the bed, and level with lathe centres. It can then be cleaned up with an end-mill, or home-made slot-drill or facing cutter, held in three-jaw, the job being fed into cut with the top-slide, and traversed across the cutter with the cross-slide. If you don't fancy that, just catch the casting in the bench-vice with the contact face of the flange showing just above the jaws, and exercise your muscles with a big flat file, second-cut for preference, until you have smoothed off the flange level with the tops of the vice jaws. Beginners note: don't file any more, once the file touches the vice jaws, or you'll need a new file for the next job. They are pretty expensive at today's inflated prices! The bolt-holes are drilled No. 34 at $\frac{1}{2}$-in. centres.

The part where you need to watch your step is machining out the grooves into which the guide-bars fit. The latter must be the correct distance apart, and at the right distance from the frame, or else the crossheads and piston-rods will bind, If any builder of this engine has a Woodruff key-seat cutter, and either a vertical milling machine or a vertical slide, for his lathe, the job is in the bag. All I have to do, is to put a $\frac{5}{16}$-in. cutter in the spindle of my vertical miller, grip the casting in the machine-vice on the table, holding by the flange, with the jaws upwards, and adjust the table so that the cutter is between the jaws, and the correct distance from the flange. The casting is then fed into cut by the longitudinal movement of the table, and traversed across the cutter by the cross-slide, repeating the operation for the second groove, the correct setting being obtained merely by adjusting the table longitudinally. I don't even have to bother about measuring the distance between the top and bottom grooves, as the table is operated by a screw having twenty turns to the inch, and there is a collar with 100 divisions on the spindle between handle and table; so it is as easy as eating cake, to give the handle the required number of turns and divisions, to get any spacing between the grooves, to a limit of half-a-thousandth of an inch.

To do the job with a vertical slide, put the cutter spindle in the three-jaw. Bolt the casting to the vertical slide in an upright position, and

adjust top-slide or saddle until the cutter is between the jaws of the casting, and the correct distance from the bolting side of the flange. Then adjust by means of the vertical slide, and traverse across the cutter with the cross-slide. The illustration shows the rig-up better than I

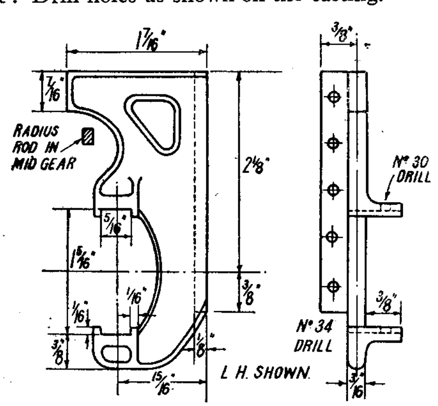


Gui de-bars

can explain it, and you don't *have* to have a $\frac{5}{16}$-in. cutter, or even a Woodruff key-seater, at that! Any cutter less than $1\frac{5}{16}$ in. in diameter, and less than $\frac{5}{16}$ in. wide, will do; a home-made one mounted on the end of a bolt about $\frac{3}{8}$ in. diameter, will do the trick. I have explained how to make them in previous notes. With a narrower cutter, simply take two or more "bites."

The grooves can be easily cut on a planer or shaper, by gripping the casting by the flange, jaws upwards, in the machine-vice, and using a cranked tool in the clapper-box. If no methods of machining are available, the humble but necessary file, used with a mixture of care and perseverance, will do the job quite well.

If you have no castings and want to use plate material for the yokes, cut them from $\frac{1}{8}$-in. brass or steel, to the given outline and dimensions; and for the bar supports, rivet a bit of 3/32-in. or $\frac{1}{8}$-in. by $\frac{3}{8}$-in. angle, at the top and bottom of the grooves. To attach them to the main frames, simply rivet a $2\frac{1}{2}$-in. length of $\frac{5}{16}$-in. by 3/32-in. angle to the side which goes to the next frame. Don't forget you need one right-hand and one left! Drill holes as shown on the casting.



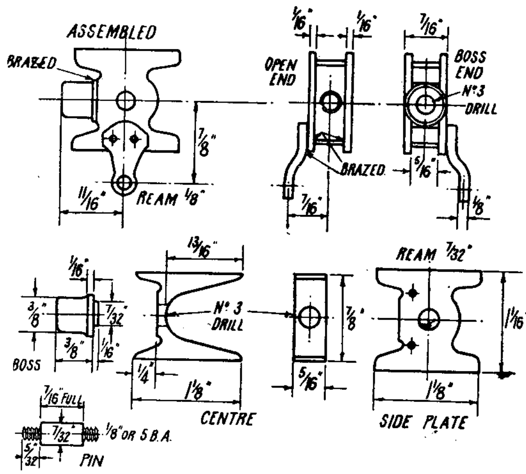
Guide yoke or motion bracket

Erection

Put the bars on the seatings at top and bottom of the gland bosses, see that they are exactly over the piston-rods, parallel with them in all ways, put the No. 30 drill down the hole in bar, making a countersink on the gland boss, follow with No. 40, tap $\frac{1}{8}$ in. or 5-B.A. and put a screw in, hexagon head for preference, appearance, and Inspector Meticulous. The brackets or yokes are then slid over the ends of the bars, and adjusted to correct position, which is with the vertical centre-line of the bracket $2\frac{3}{4}$ in. ahead of the leading coupled axle centre, but don't drill the bolt holes in the frame until you have made and fitted the cross-heads and connecting-rods. Just put a couple of clamps over flanges and frame, to hold them until finally adjusted.

Crossheads

Scheming out the crossheads gave me the proverbial "pain in the neck." It's easy enough to write "take a piece of steel, mill and groove top and bottom, cut away the centre, drill holes



Built-up crosshead

for pin and piston-rod, and turn the boss" but there has been much too much of that sort of "instruction"—save the mark!—in the past. Don't I know it—my correspondence tells many tales. I'd just love to see one of these merchants with a chunk of steel, trying to follow his own directions for getting out the deep cavity in which the little-end of the connecting-rod works!

If our advertisers who are supplying castings can manage to produce cast crossheads in nickel-bronze (German silver) with a recess for the little-end cored out, it will save a lot of work. The grooves at top and bottom can be milled out exactly as described for axleboxes, clamping the casting under the slide-rest tool-holder level with lathe centres, and traversing across a $\frac{5}{16}$-in. end-mill or slot drill held in three-jaw. The boss can be turned with the casting held in four-jaw; the sides smoothed with a file, drilled No. 3 and reamed 7/32 in. for crosshead pin; and the cross-head arm, or drop arm, filed out of a bit of $\frac{1}{8}$-in. steel, fixed temporarily with a screw, and silver-soldered.

Howsumever, as the poet saith, if no castings are available, or if you prefer steel crossheads, proceed as follows: Chuck a piece of $\frac{7}{8}$-in. by

$\frac{5}{16}$-in. steel bar (commercial size) in the four-jaw, with about $1\frac{1}{4}$ in. projecting, and set to run truly. For beginners' benefit, set a pointed tool in the slide-rest, and adjust chuck jaws until, when the belt is pulled by hand, all four corners of the piece of steel just scrape the tool. By setting the tool close to the steel, you'll see in a jiffy, when the belt is pulled, which way to adjust the jaws. Face the end, centre, and drill 7/32 in. for about $\frac{3}{8}$ in. depth; then, with a rather pointed round-nose tool set crosswise in the rest, recess out the end as shown in the side view of the crosshead centre, leaving about $\frac{1}{8}$ in. in the middle, faced off dead flat. Part off at $1\frac{1}{8}$ in. from the end, and repeat operation for second crosshead. Next, grip the piece of metal in the vice, blank end upward, and saw a V-shaped piece out, finishing to outline shown with round and flat files. Turn up two bosses from $\frac{7}{16}$-in. mild-steel rod, to the dimensions shown; turn the large end first, centre and drill No. 3, and after parting off, reverse in chuck and turn the pip to a very tight fit in the hole in the back of the crosshead centre.

The next stage of the proceedings is to saw and file the side plates; all four can be done at once, same as you would saw main or bogie frames. Cut four pieces of 16-gauge bright steel, a little over $1\frac{1}{8}$ in. square, mark one out, and drill a couple of holes with No. 51 drill, about the position of the two little circles. Use the piece as a jig to drill the others, temporarily rivet together with $\frac{1}{16}$-in. rivets, and saw and file the lot to outline. Put a No. 3 drill through the middle. Part the plates, and file off any burr.

To assemble, drive the pip on the boss into the hole in the centre section, then put one of the plates each side. A temporary bolt through the middle hole, will hold the plates to the centre-piece whilst you adjust the latter so that it is equidistant between top and bottom of the side plates, overlapping 3/32 in. in both places, and level with the ends of the centre piece. Screw up the bolt tightly so that the centre piece is firmly held, then run a No. 51 drill through the lot, using the holes in the plates as guide. Put in a couple of rivets (bits of 16-gauge wire will do) and rivet over tightly. You needn't bother about forming proper heads, as long as they hold tight. Then cut out and bend the drop arm from $\frac{1}{8}$-in. mild-steel, to shape and size shown, and attach it to the crosshead either by two small rivets or a single screw. The temporary bolt through the crosshead pin-hole can then be taken out, the rivets holding the bits together for the brazing process.

Put a little wet flux, such as Boron compo, Sifbronze flux, Tenacity No. 3 or any other good brand, around the inside of the cavity, the boss, and the joint between drop arm and side plate. Heat the whole issue to bright red, and touch the joints with a bit of 16-gauge soft brass wire; if you have used Sifbronze flux, use $\frac{1}{16}$-in. Sifbronze rod. Either will melt and flow into the joints; warning—be sparing with the brazing material, for if you get a blob in the cavity, it will want some getting out, and a little in the proper place is just as strong and effective. Let cool to black, then quench in water; wash off, and clean up. Both sides are smoothed off with a file, and you can polish them up a bit with emery-cloth if you wish; any brazing material that has seeped through into the top and bottom grooves, should be smoothed off with a file, and the side plates trimmed to outline if they need it. Put a 7/32-in. reamer through the centre pinhole, and enter the " lead " end of it into the hole in the boss, so that you can start the piston-rod truly, when attaching crossheads to piston-rods.

The crosshead pin is a bit of 7/32-in. round silver-steel $\frac{3}{4}$ in. long with 5/32 in. of each end turned down to $\frac{1}{8}$ in. diameter and screwed $\frac{1}{8}$ in. or 5-B.A. Ordinary commercial nuts are used.

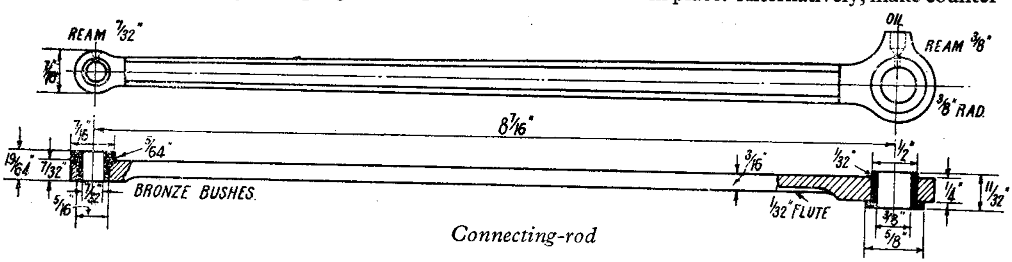
Connecting-rods

As the connecting-rods are made by exactly the same process as the coupling-rods, no detailed instructions are necessary, as it is only " repetition of ritual." Each rod will need a piece of mild-steel of 1-in. by $\frac{1}{4}$-in. section, and approximately $9\frac{1}{4}$ in. long, milled, or sawn and filed to the outline and dimensions shown. In case anybody starts to write in and tell me that I can't tell top from bottom, and have shown the flange of the little-end bush on the wrong side, I had better make it clear right away, that this is intentional, and quite O.K. If you care to lay out for yourself, a plan of the driving-wheel with the connecting-rod in place at the outer end of the crankpin, and the cylinder with the crosshead in section, you'll see that the outer side of the little-end boss on the connecting-rod just enters the cavity in the crosshead, almost touching the outer plate, but leaving a gap of 3/32 in. between the inner side of the boss and the inner plate of the crosshead. It is a pity to waste valuable bearing space at a point where the full power of the cylinder is transmitted; also, it wouldn't be very good engineering practice to leave the little-end flopping about, in a manner of speaking. So, if you put in the headed bronze bush shown, with the head on the inside, you kill two birds with one shot by providing greatly increased bearing surface, and taking up the side play. The connecting-rod is also maintained parallel to the centre-line of motion, so that the push and pull on the crankpin is " all fair and square."

A similar bush is fitted to the big-end; and both should be made of good hard phosphor-bronze, which our advertisers should be able to supply. After pressing in the bushes, drill oil-holes clean through bosses and bushes, as shown by dotted lines. I have not shown any top cover to the oil-box on the big-end; but if any builder wants to make a posh job, he can tap the counter-bored part, and make a couple of dinky little hexagon brass caps to screw in. I bet that will raise a loud cheer from that worthy magician of the pencil, Mr. F. C. Hambleton; and that reminds me of something. I don't know of a single locomotive " fan " who doesn't share your humble servant's admiration of friend Hambleton's outline drawings; but he has a powerful rival in Mr. J. N. Maskelyne. Their efforts at delineating locomotives that have been, or are, needs no praise—they speak for themselves, if you can apply such a term to drawings—but what of the future ? In this age of perambulating spam cans, it is a relief to give free rein to imagination, and speculate on what might be; so what about each of the above-mentioned lovers of

locomotive grace and beauty, setting down what they consider the most suitable *outline* for the future express passenger engines of British Railways? I'd love to see the drawings; so would hundreds of others to whom the sight of a "Flannel Jacket" or a "Silver Link" is a nightmare; and I would gladly do my little bit by providing suitable "works" and the inside arrangements of boiler, etc., so that anybody who wished, could make F.C.H.'s or J.N.M.'s dreams come true in 3½-in. gauge.

in the stroke; if they go hard anywhere, slack the clamps holding the brackets to the frame, and try again, leaving the clamps slack until the crossheads pass the brackets and reach the extremity of their travel. If the clamps are tightened with the crossheads in that position, they should work freely on full stroke; the No. 34 drill can be put into the holes in the flanges of the brackets, and the holes continued right through the frame. File off any burrs, and put in 6-B.A. bolts to keep the brackets in place. Alternatively, make countersinks on the frame with the No. 34 drill, and continue through frame with No. 44, tapping 6-B.A. and using hexagon-head setscrews to hold the bracket to the frame. Turn the wheels so that crossheads are between the bars at the point where the jaws of the brackets are bearing against them. Run the No. 30 drill through the holes in the projections, making countersinks on the guide-bars. Shift the crosshead, drill the bars No. 40, tap ⅛ in. or 5-B.A., and put in hexagon-headed set-screws, carefully filing off any of the screw that protrudes through the sliding surface of the bar. Weeny spring washers are now on sale by some of our advertisers, and I recommend their use under the heads of the set-screws, also in any other part of the motion work where there is likely to be vibration. I have used spring washers on all the eccentric straps and big-end bolts of my L.B. & S.C.R. engine "Grosvenor," as I'd just hate to have anything come loose when that lady is knocking five minutes off her big sister's record between Victoria and Portsmouth!



Connecting-rod

Final Assembly

Coming back to realities, try the crossheads between the guide-bars whilst the yokes are still temporarily clamped to the frame, and see that they slide easily without being slack. Also try if they will go on the piston-rods; they shouldn't be an absolute drive fit, but should be fairly tight. Now put the connecting-rods on, entering the little-ends in the crossheads, and fitting the pins. Push the piston-rods right in, and put a crank on front dead-centre, the boss of the crosshead going over the piston-rod. Now carefully advance the piston-rod another 1/32 in. into the crosshead, giving that much clearance between piston and cover on dead centre; drill a No. 43 hole clean through crosshead boss and piston-rod, and squeeze in a 3/32-in. silver-steel pin, or a bit of 13-gauge spoke-wire, to act as a cotter.

Repeat operation on the other side of the engine, then turn the wheels by hand. The crossheads should slide easily between the guide-bars, with neither binding nor slackness at any point

The Wicksteed Regatta

In spite of the threatening weather, the Wicksteed Model Yacht & Power Boat Club was able to hold its first power boat event since 1939.

We were pleased to welcome members from Coventry, Bournville, Altrincham and Guildford, making it possible for three boats to enter for each event.

In the 30-c.c., or "A" Class for the Timpson Trophy, 1,000 yd., Mr. Williams (Bournville), with *Faro*, showed a fine turn of speed, and clocked a speed of 35.948 m.p.h. Mr. Waterton (Altrincham), *MU*.4, managed to obtain 29.601 m.p.h. For the Newman Loake Cup, 500 yd., "A" Class, the result showed: Mr. Williams's *Faro* still tuned up well with 34.091 m.p.h., with *MU*.4 giving 27.056 m.p.h. The Wicksteed boat evidently did not like getting wet, as she refused to show what she could or could not do.

Thus Mr. Williams gained both trophy and cup.

In the "B" Class, 15 c.c., we had *Annette* (Mr. Churcher, of Coventry), *B.V.*16 belonging to Mr. Dalziel, of Bournville, and *Vesta II*, owned by Mr. Jutton, of Guildford. The latter was very unlucky, as it was unable to make the course, having come to grief on two occasions. It was noted that perhaps the centre pole was a little too high for this flash-steam boat, and maybe this may have accounted for the mishaps. *Annette* was also unable to make the grade, and so Mr. Dalziel carried away the Perkin's Cup with 21.946 m.p.h., on a 500 yd. circular course.

We were very pleased to see Mr. Whitworth and party from Bedford, who are building up a strong club, also Mr. Randal and friends from Derby.

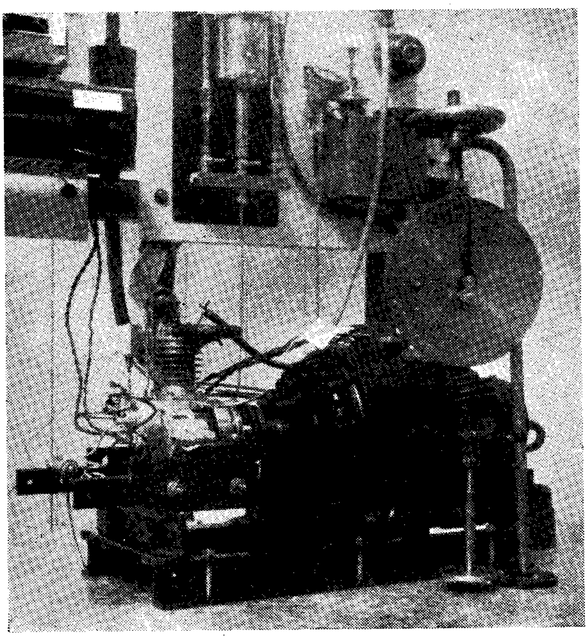
The trophy and cups were presented by Mr. L. A. Garrett, the club president, who also timed the events, assisted by Mr. Dalziel (Bournville), and Mr. H. Carr (Wicksteed).

PETROL ENGINE TOPICS

*Testing Small I.C. Engines

by Edgar T. Westbury

MANY years ago, I built a dynamometer of this type, which was quite successful within the limits of its electrical capacity, though this was too limited to keep pace with the requirements of engine development (Fig. 4). Mr. D. H. Chaddock built a larger brake, with which a great deal of extremely valuable research work on my own and several other constructors' engines was carried out. This dynamometer also is now employed by the S.M.E.E. in their testing laboratory. In passing, I would like to express my appreciation of the enterprise shown by this society, in encouraging the testing of engines, a departure which is long overdue, but which will, I hope, be followed up by many other societies.



Mr. Chaddock's swinging-field dynamometer, with 15-c.c. "Kiwi" engine on test

Electrical dynamometers which utilise magnetic or eddy-current braking are comparable to the generator type in respect of flexibility of control, but they must necessarily be energised from outside electrical supply at all times, and cannot be used for motoring tests. Moreover, as the energy is dissipated at its source in the form of heat, the amount of power they can handle is limited. Generators also inevitably produce a certain amount of heat, but this is small, compared with the power input, and can generally be handled by the ventilating fan incorporated in the armature.

Any small generator, either high or low voltage, which is capable of handling the maximum engine power, and can be adapted for swinging about its axis, with means of torque measurement, is suit-

* *Continued from page 99, " M.E.," July 22, 1948.*

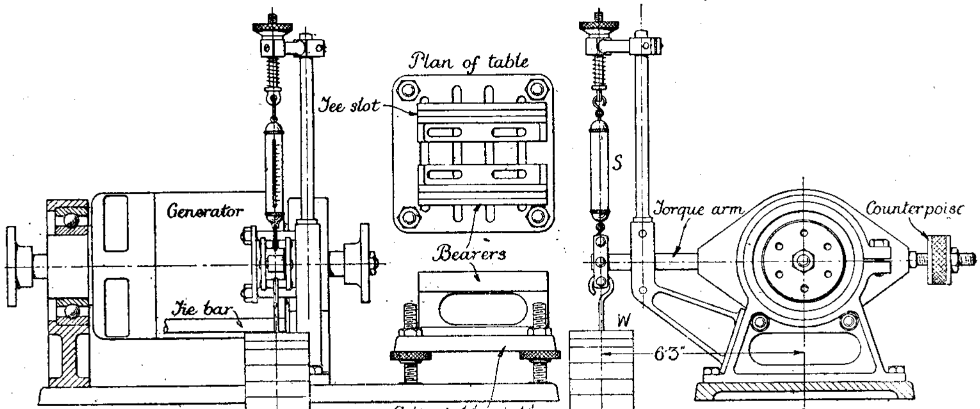
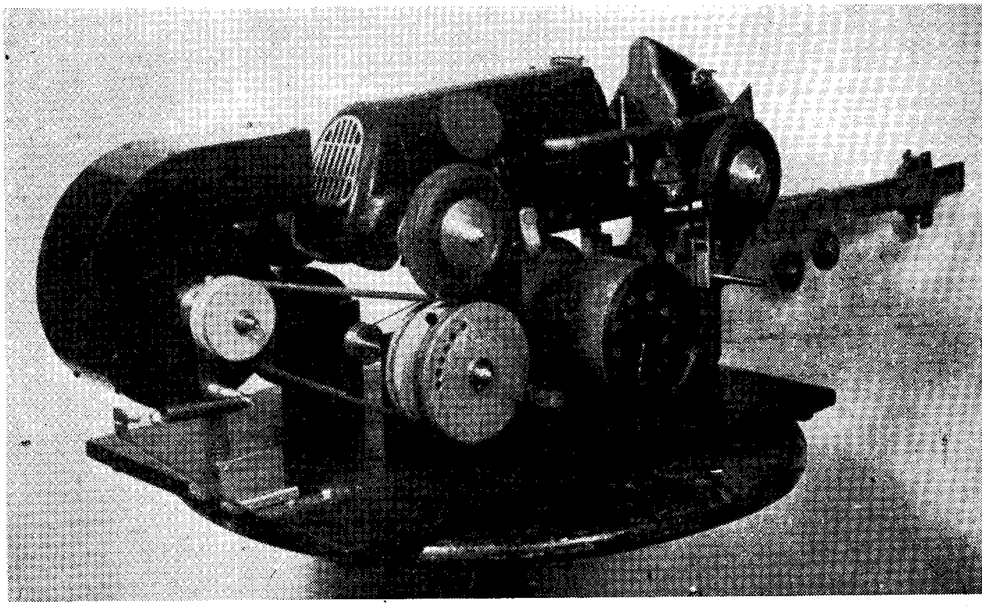
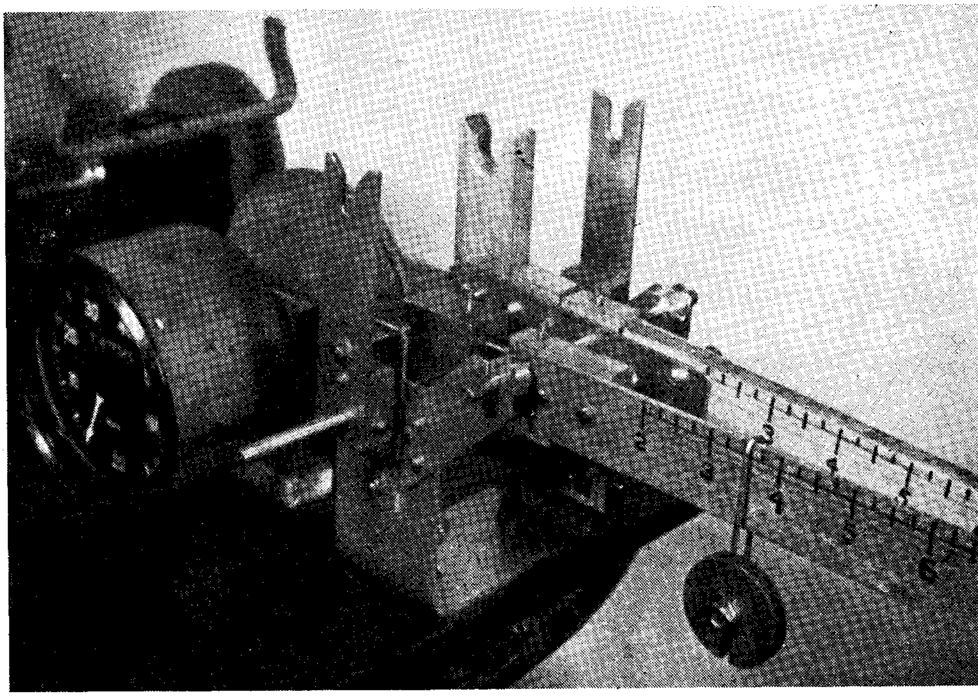


Fig. 4. The writer's original swinging-field dynamometer (" M.E.," July 25th, 1935)



Mr. Curwen's model racing car test stand, showing his 5-c.c. front-wheel drive car on test



The thrust and torque arms of the car test stand

able for use as a dynamometer, but if it is desired to use the machine also for motoring tests, a supply of direct current at appropriate voltage to suit its running requirements, must be provided.

Transmission Dynamometers

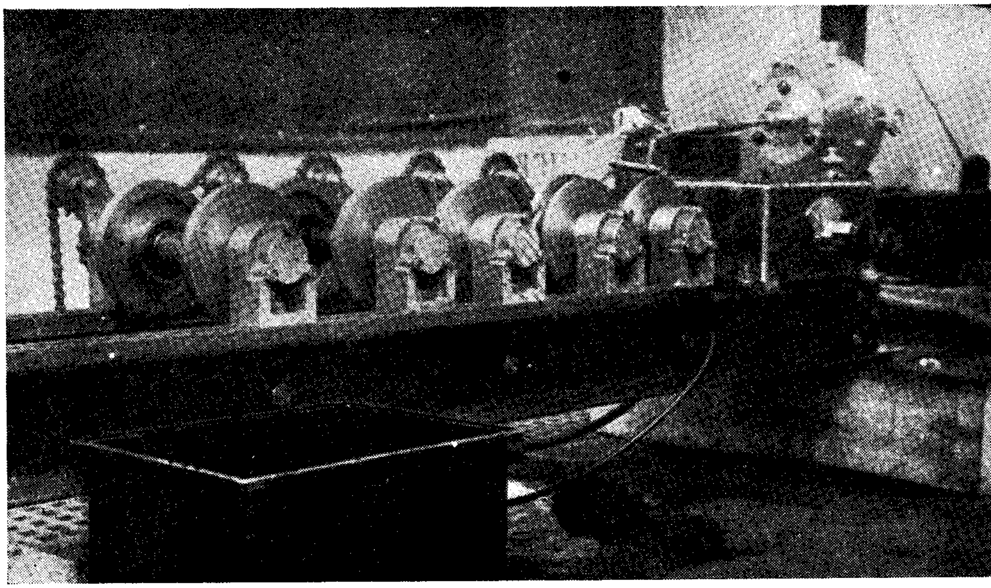
It is possible to test the torque actually developed by an engine in the course of carrying out its normal work, by means of a transmission dynamometer. This usually takes the form of a special coupling incorporating an elastic member which deflects under the influence of torque, and embodies some method of measuring the amount of deflection while the engine is running. A device of this nature is generally known as a "torsionmeter," and it is often fitted as a standard part of the equipment in the engine room of a ship, while in recent years, I understand, it has been effectively employed also in aircraft.

Some types of torsionmeters measure the deflection by optical means, through a system of reflecting mirrors; others are purely mechanical, and yet another type works electrically, by measuring phase difference between two armature units at the driving and driven ends of the coupling respectively. So far as I am aware, nobody has yet built a torsionmeter suitable for testing engines of the size now under consideration. It would undoubtedly be a very delicate instrument, and in the particular circumstances, does not offer any great advantages over the more usual methods of testing.

In the case of engines driving machinery by belt or other forms of gearing, it is possible to compute the torque transmitted by measurement of the stresses in the drive. This can be done in the case of belt or chain gearing, by weighing the difference of tension between the tight and slack sides of the belt or chain. I am not convinced, however, that a device of this nature would prove very accurate or easy to handle if used in small engines running at very high speed.

Overall Tests of Plant

So far, only the methods of finding brake h.p. of engines has been considered in these articles, and there is no doubt that this is the most important item of information, in respect of their practical application, which will be required by users. There are, however, many other facts and data which are extremely useful to the experimenter, and which can elicited by appropriate methods of testing.



The S.M.E.E. locomotive test stand

It would hardly be possible, in the space at our disposal, even to outline all the many forms of tests, and the methods of carrying them out. To name but a few, there are fuel consumption, air intake, volumetric efficiency, instantaneous temperatures and pressures at various points in the cycle, oil drag, thermal losses, and so on. Some of these tests would call for elaborate instruments and no small skill on the part of the investigator, but others can be carried out with quite simple equipment.

However, I have very little doubt that most readers will be primarily interested in the purely mechanical branches of testing, and the knowledge of exact power output of the engine will go a very long way in assisting development.

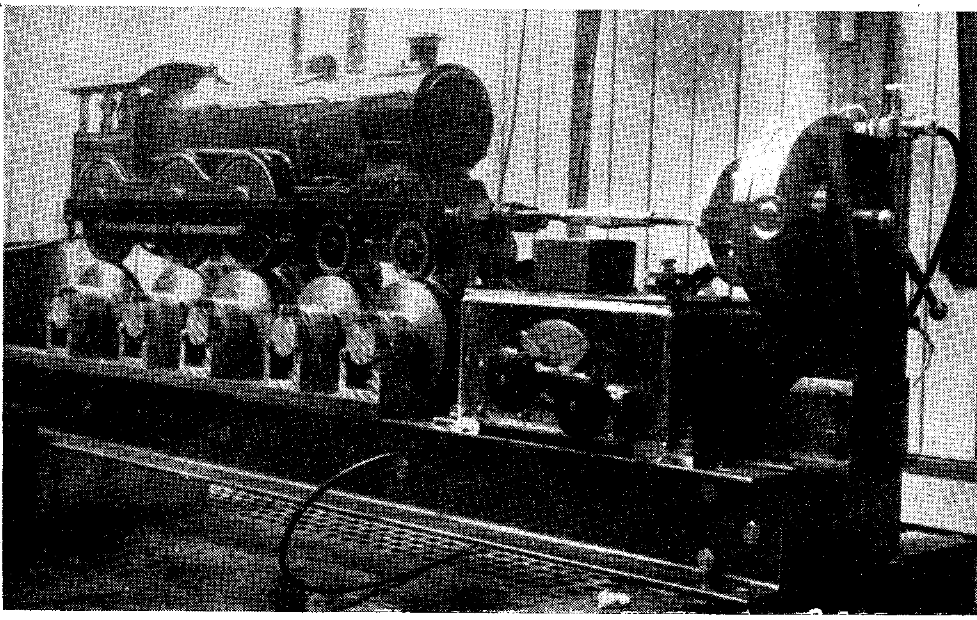
It very often happens that an efficient engine is not used to the best advantage, because of some inefficiency in its method of installation or application. For instance, in a boat, the method of coupling or gearing the engine to its propeller, or friction in the shaft bearings or stern gland; or in the case of a car, an unsuitable gear ratio,

may account for very serious power losses, and these details will repay careful investigation.

Mr. R. H. R. Curwen has produced a most ingenious model racing car stand which has been fully described in *The Model Car News*. This device is equipped with balances for weighing both torque and tractive effort at the track wheels, and the transmitted power is finally absorbed by an enclosed centrifugal fan, the outflow of which is used to cool the engine under test, and load control is applied by a shutter on the intake side. Tests made with the aid of this device, have enabled actual track conditions to be reproduced with very fair accuracy, and the success of Mr. Curwen's models in actual racing undoubtedly owes much to the experience gained in using this test stand.

The efficiency of any type of transmission gearing can readily be tested while under load by mounting the gearbox on a torque balance. In tests of this nature made many years ago, I found that very serious losses often occur in small gears, and that material, accuracy, quantity and quality of lubrication, all have very far-reaching effects on efficiency, so it is obvious that these details merit the most searching investigation.

Although these articles are intended to cover only the testing of small i.c. engines, I trust readers will pardon a slight digression, in the reference to the model lcomotive test stand built by the S.M.E.E. This form of device has been the subject of much discussion in the past, and many arguments have been brought forward, both for and against it. Of the test stands built in the past, few have carried the idea to its logical conclusion by providing means of load control and accurate measurement of forces. (One constructor of such a stand used a *flywheel* to apply the working load!) These essentials, however, have been properly dealt with in the S.M.E.E. test stand. The power of the locomotive is absorbed, through rollers coupled by chains and sprockets, by an oil pump with throttle control of delivery; and tractive effort is weighed by means of a delicate pressure balance of the hydraulic diaphragm type. Adjustment of the rollers is provided to suit the arrangement and wheelbase of the driving wheels.



Mr. J. Crebbin's veteran loco "Cosmo Bonsor" on the test stand

The overall test of plant efficiency in a model boat, no matter what method of propulsion is used, can be tested by floating the model in a tank and providing means of weighing the torque reaction and tractive force of the propeller while running. It is, however, important to note that figures obtained from static thrust tests of propellers must be treated with reserve, as they do not necessarily give a true representation of *dynamic* thrust at working speed. They can however, show how much of the engine power is usefully absorbed by the propeller under actual working conditions, if used in conjunction with h.p. tests of the engine alone.

This brief review of the theory and practice of mechanical testing equipment, applicable to the requirements of small high-speed engines will, it is hoped, clear up many queries on the subject which have been received recently and also encourage users of engines to take more interest in this aspect of their development. If the interest in the subject justifies it, I shall be pleased to give further details on the design of test equipment, or to describe any of the supplementary tests employed in the up-to-date engine laboratory, either for research or production routine.

A Motorised Grinding Machine

With Flexible Drive

by W. J. Hawkins

THIS useful flexible spindle, can be cheaply and easily made by the model engineer enthusiast, and when finished will do many grinding jobs very efficiently and will no doubt save both time and temper.

As will be seen by the sketches, the actual grinding spindle, and the driving spindle, motor end, marked "hub and spindle" No.'s 1 and

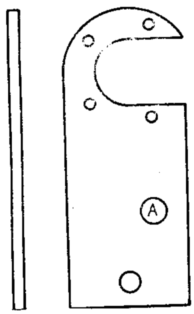


Plate A

2, are front "bicycle wheel hub and spindle" complete; these, as most readers will know, are built up with an easily adjusted ball-bearing at each end, and if properly adjusted will run at a very high speed with a very small amount

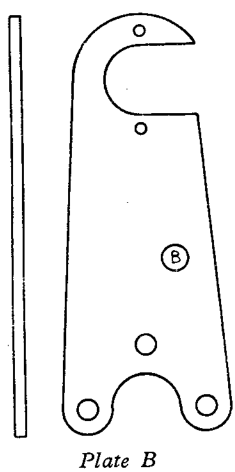
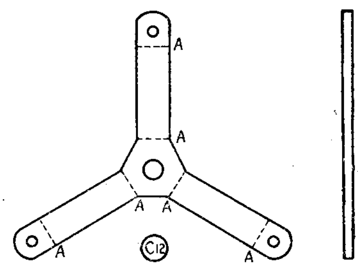


Plate B

of trouble; the flange of hub No. 2 is turned off as shown in part 1. The driving unit is a small mains motor, of the type that is now being sold by Government surplus dealers (converted from rotary converters), offered for sale at a £1 or so in advertisements of this, and other engineering journals.

Plates and Spider

Two plates *A* and *B* are now made up and drilled to hold the driving unit, shown at part 2, and suitably bolted to the motor. The two spiders are next made, as shown at *C*1 and *C*2, the plan of which is shown at *C*12, before bending. These are to take the adjusters and split distance tube shown at *D*, which is to enable enough slack of the inner cable (purchased complete with adjusters, outer and inner cable, *E* and *F*, which is a B.S.A. type heavy motorcycle clutch cable, obtainable from any good cycle stores or garage, to be soldered to the ends of both grinding and driving spindles, this being accomplished by drilling a hole slightly larger than the diameter of the inner cable, about $\frac{3}{8}$ in. deep, which must be dead central of the spindles. The cable is then soldered firmly in situation, the distance tube *D* is slipped over the cable and adjusters screwed out until



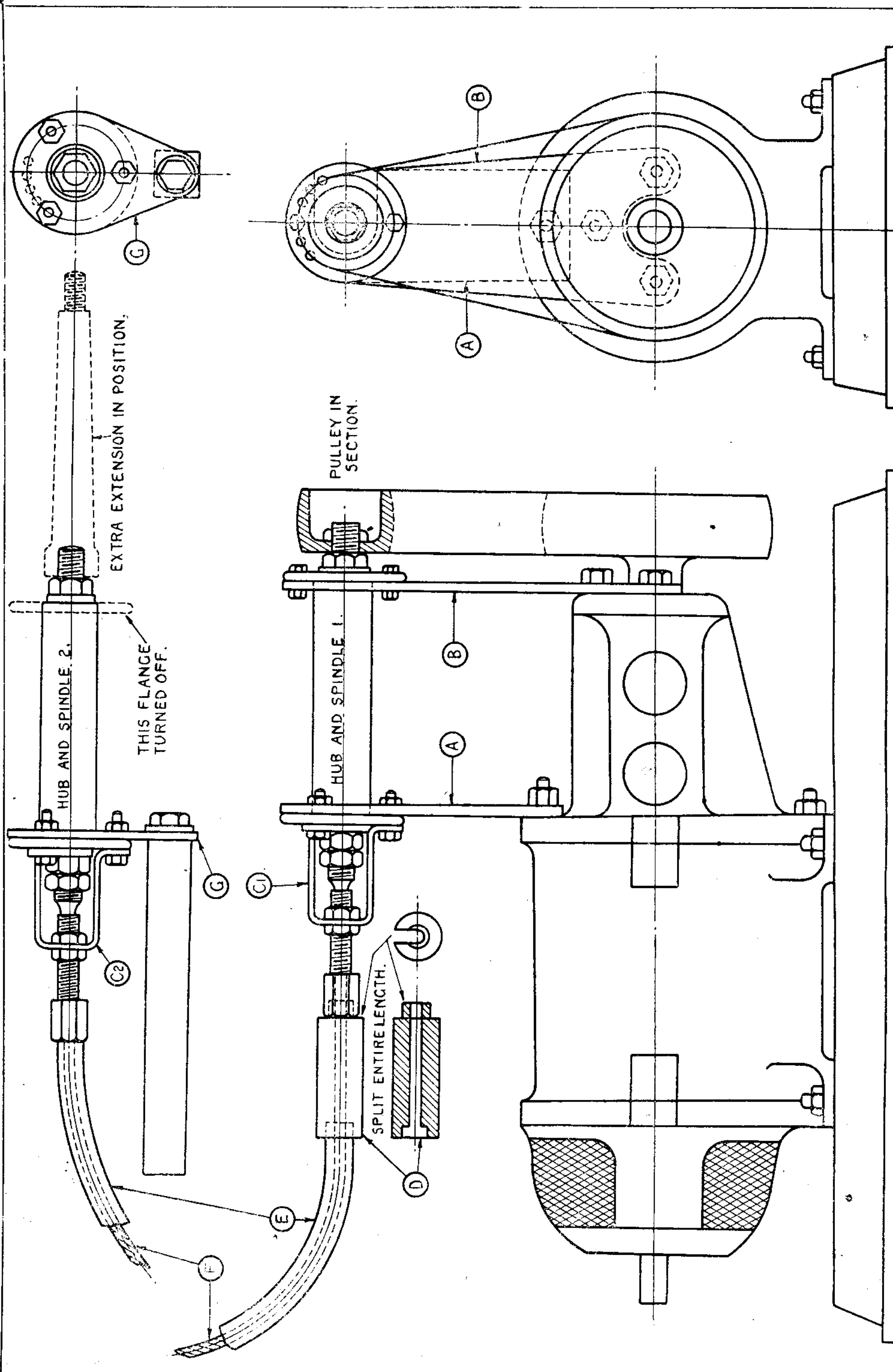
BEFORE BENDING AT A.

The spider

all slack is taken up between the two members. The lubrication used throughout cable and spindles is the best graphite grease.

The Pulleys

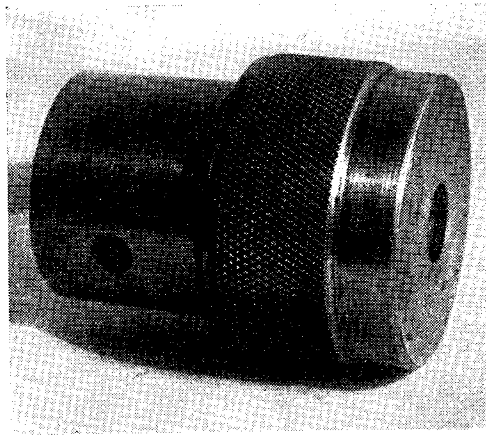
A plate *G* is next made to carry the No. 2 spindle which, in turn, is bolted to a square piece of steel (the size required to fit individual tool posts) for holding same. Two pulleys now are required, one shown in section on hub and spindle No. 1, and the other made to fit the driving spindle of the motor (a ratio of 2 to 1 will be found suitable, this giving a useful turn of speed for all-round general work). A light tape belt now completes the driving unit, which, when in use, can be placed on a stool, or under the bed of the lathe. A word of warning must be given here: run the spindle only in a *clockwise* direction, as the reader will see that if this is run anti-clockwise the wheel or extension (one is shown in chain line in part 1), is bound to unscrew, with disastrous results to the operator, machine or both.



(Above)—Part 1, and (below)—Part 2 of the motor-driven flexible grinding machine

A Collet Chuck

by C. R. Jones



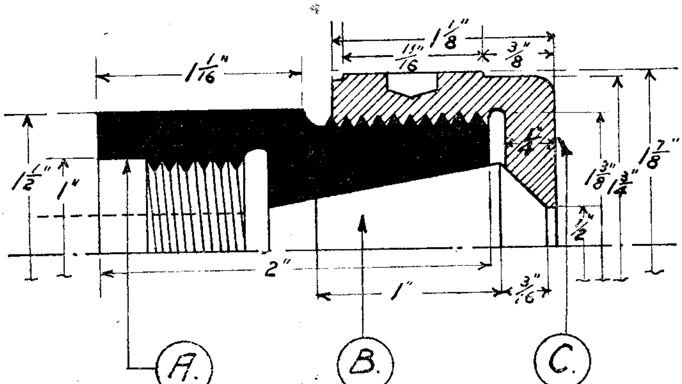
The complete chuck

SOME form of collet chuck is a useful fitment to a lathe, as it enables round material to be held dead true without the necessity of setting up each time. One limitation is, of course, the size of the hole through the mandrel; also, with the usual type of collet chuck, the useful size is much cut down by the draw-in tube necessary for tightening.

The chuck illustrated was made to screw direct on to the mandrel thread, and the type of collet used; also, the method of tightening, enables the material to be fed right through the mandrel, and enables the full size of the bore of mandrel to be utilised. In the present case this is $\frac{3}{8}$-in. diameter.

In an article in THE MODEL ENGINEER dated December 2nd, 1943, Mr. J. Latta described how to make a similar chuck for use mainly for holding end-mills securely and truly, but the chuck illustrated was provided with a No. 2 Morse taper shank.

The chuck to be described was made from these instructions, but without the taper shank, and has been very successfully used for both holding mills and also round stock.



Half-section through collet chuck

The body portion (A) was made from a piece of B.M.S. $1\frac{1}{2}$ in. diameter, this being carefully set-up in the four-jaw chuck and drilled, bored and screwcut a GOOD fit for thread on lathe mandrel, making sure that the plain portion was a good fit as well.

After this operation it was screwed tightly on mandrel and turned down to the dimensions shown in the half sectional drawing, the exterior threaded portion being $1\frac{3}{8}$ in. diameter and threaded twelve threads per inch.

The centre had been drilled right through in the first operation and this was now bored out with the topslide set to a 10 deg. angle, making the total angle of bore 20 deg. The outer and larger end of this bore was finished at $\frac{13}{16}$ in. diameter, to accommodate the collets.

The cap (C) was bored out and screwcut internally a good fit on the external thread of (A) a hole $\frac{1}{2}$ in. diameter was drilled through the end and this was tapered off with the topslide at a 45 deg. angle. This portion seats on the larger end of collet when in place.

The outside of the cap was turned in place on portion (A), and was afterwards knurled.

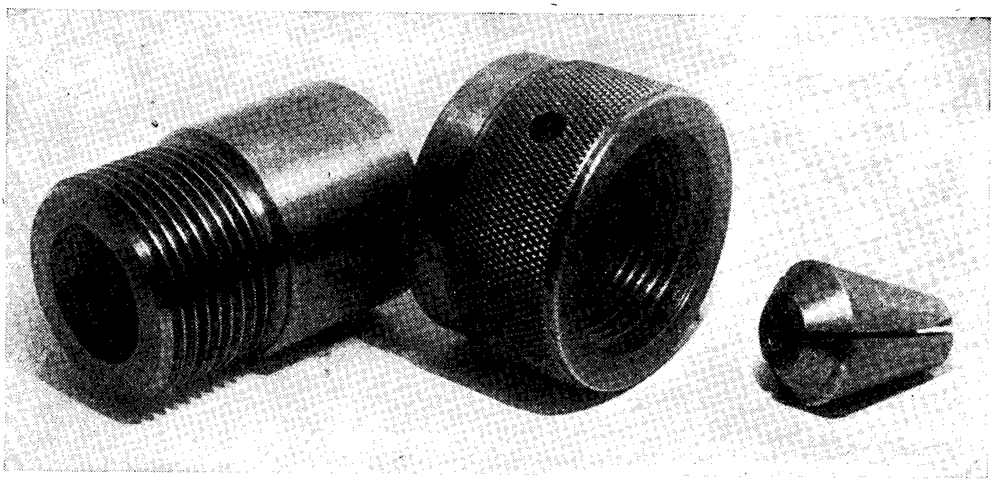
Half-a-dozen collets were then turned up from mild-steel and were made a good fit in the tapered portion of body; the taper on the larger ends being turned with the topslide set to a 45 deg. angle, the total length of collets being $1\frac{3}{16}$ in.

The solid collets were then placed one by one in the collet chuck, and were drilled and carefully bored right through to various standard sizes, the largest, of course, being $\frac{3}{8}$ in. diameter.

Special boring tools were made for the smaller sizes.

They were afterwards split right through longitudinally in one place, and nearly through in the other two positions, all burrs being carefully removed.

Some difficulty was encountered in removing the chuck from the mandrel, so a $\frac{1}{4}$ in. diameter hole was drilled in the body (A) where shown,



View showing components of collet chuck

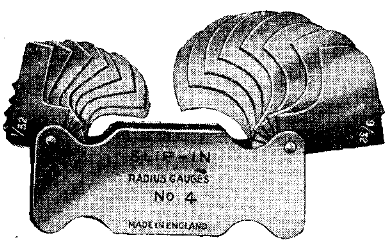
and about ⅛ in. deep. The same proceedure was carried out with the cap (C), and afterwards two "C" spanners for tightening and undoing were made. I have found that occasionally the collets are somewhat difficult to release from the stock being gripped, and possibly another system of splitting the collets would minimise this trouble, but so far I have not altered any.

Thanks are due to Mr. Latta, as I have found this chuck a very useful piece of lathe equipment.

The chuck illustrated and described, fits a 3 in. "Winfield" lathe.

Handy Test Gauges

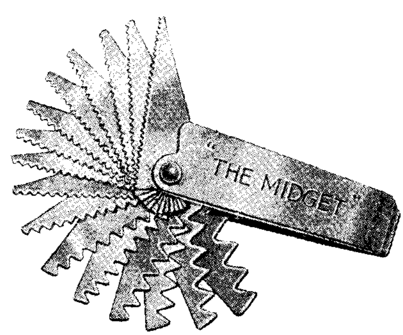
MESSRS. J. H. GRANT & CO., North Heath, Erith, Kent, have submitted for our inspection samples of their products, which include the well-known "Unique" Test Indicator, the "Midget" Screw Pitch Indicator, and "Slip-in" Radius Gauges, all inexpensive tools, the utility of which has been proved by many amateur and professional engineers in the past.



The "Slip-in" set of internal and external radius gauges

The "Unique" Test Indicator calls for little comment here, as it has been referred to many times in THE MODEL ENGINEER; it constitutes an inexpensive but thoroughly serviceable substitute for an elaborate Dial Test Indicator, and its simple, light construction renders it specially sensitive.

In the Screw Pitch and Radius Gauges, thin blades of tempered steel are employed, and the methods of production ensure perfectly clean and accurate contours. The tapered blades of the screw pitch gauges enable them to be inserted into small nuts or tapped holes. They are made in Whitworth pitches (in two sets, for large and small sizes) B.A., Metric, and U.S. National pitches (two sets). In the Radius Gauges, the profile of each blade provides both internal and external radii of the stated dimensions, and the profile is continued at a tangent each way, giving sides at 90 deg. in each case. They are made in decimal sizes, fractions (two sets), and metric dimensions. These gauges can be obtained from all high-class tool dealers.



The "Midget" screw-pitch gauge